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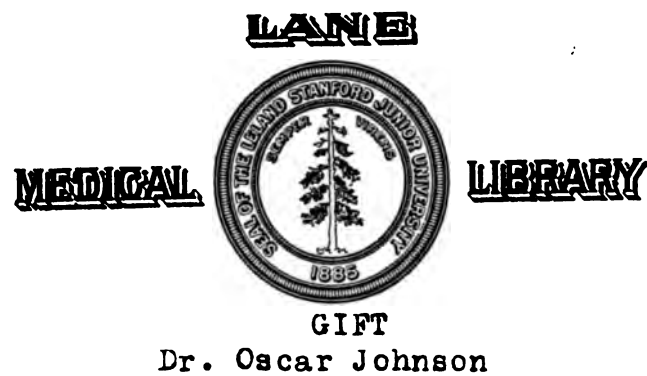
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BRIGGS AND JOHNSON



LECTURES TO GENERAL PRACTITIONERS ON THE
DISEASES
OF THE
STOMACH AND INTESTINES

*With an account of their relations to other diseases
and of the most recent methods applicable to the diagnosis
and treatment of them in general ; also " The
Gastro-Intestinal Clinic," in which all such diseases
are separately considered : : : : : :*

BY
BOARDMAN REED, M. D.

PROFESSOR OF DISEASES OF THE GASTRO-INTESTINAL TRACT, HYGIENE, AND CLIMATOLOGY IN THE DEPARTMENT OF MEDICINE OF TEMPLE COLLEGE, PHILADELPHIA; ATTENDING PHYSICIAN TO THE SAMARITAN HOSPITAL; MEMBER OF THE AMERICAN MEDICAL ASSOCIATION, AMERICAN CLIMATOLOGICAL ASSOCIATION, AMERICAN ACADEMY OF MEDICINE, AMERICAN ELECTRO-THERAPEUTIC ASSOCIATION; FOREIGN MEMBER OF THE FRENCH SOCIÉTÉ D'ÉLECTROTHÉRAPIE, ETC.

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PREFACE

THE majority of physicians now in practice have had no opportunity of learning the newer methods available in the diagnosis and treatment of diseases of the digestive system; hence books describing them are necessary. These methods are better than the old ones because far more accurate and efficient. They are indispensable to the successful management of many of the prevalent gastro-intestinal affections.

Yet books upon this subject have been multiplying during the last ten years, and it may well be asked, Why add to the number? The question would be justifiable, since the subject has been treated most ably and exhaustively by several American writers, to say nothing of the works by foreign authors—Ewald, Boas, Riegel, *et al.*, which have been translated into English. I could not hope to rival them in completeness and erudition, nor in the profundity with which they have considered some of the many as yet unsolved pathologic problems in this field.

There does not at present, however, exist in the English language any work which, in a single volume, treats of the whole subject of diseases of the stomach and intestines from the standpoint of our present knowledge.

Not only general practitioners, but also specialists in other lines who find it necessary to keep informed in a general way with regard to digestion and nutrition, have discussed with me what they desire to have in such a book. They want a not too

bulky volume, which should contain brief, but easily intelligible, descriptions of the simplest reliable tests for the necessary objects of study in the gastric contents and feces, as well as the most practicable, and especially the least disturbing, methods of determining the position, size, and motility of the stomach, colon, etc.—*i. e.*, demonstrating dilatation or displacements of any of the abdominal viscera, including abnormal mobility of the kidneys—together with a brief statement of so much of the pathology and ætiology of the different gastro-intestinal affections as is certainly known; besides a full account of the symptoms and diagnosis, and especially an ample consideration of the treatment. To meet these requirements the single-volume work must necessarily omit much of interest, such as historic observations, speculative discussions as to mooted points in ætiology and pathology, and the bibliography of this special subject, which has now grown to vast proportions.

In this volume of lectures the attempt has been made to furnish such a book as is above outlined—a plain and unpretentious, but practically complete, clinical guide to the diagnosis and treatment of the diseases in question. I am fully conscious of its many imperfections, for which the indulgence of readers is craved. It embodies, however, the results of much personal experience during a long and busy practice, and an earnest effort honestly to record and interpret this experience. Furthermore, while duly conservative as to advising the abandonment of old and well-tried remedies, I have in these lectures given such credit as seemed due to the most recent innovations in the way of therapeutic resources for the diseases under consideration, especially the applications of electricity in all its forms, including the electrostatic currents and x-rays; also the violet rays, radium, etc., as well as mechanical vibra-

tion, manual therapy, hydrotherapy, exercise (active and passive), and all the approved hygienic measures, particularly an unusually full consideration of the exceedingly important subject of diet.

The lectures are based in part upon those delivered to my classes in the Department of Medicine of Temple College, Philadelphia, and in part upon the "Talks to General Practitioners" contributed by me to the *International Medical Magazine* during the five years that it was under my editorial management. All of these have been carefully revised, and many of them almost entirely rewritten. A still larger number of the lectures have been prepared expressly for the present work, including a special one entitled, A Symptomatic Guide to Diagnosis. This unique feature, it is hoped, will prove useful to both students and practitioners. I am under obligations to my associates, Dr. W. E. Rahte and Dr. George O. Jarvis, for valuable assistance in preparing this and several of the other lectures.

Thanks are due also to my colleague, Prof. W. Wayne Babcock, for permission to incorporate in the lecture on Displacements of the Colon his particularly interesting illustrated paper upon that subject, and to my colleague, Prof. A. Robin, for contributing toward several of these lectures, including especially those upon Examination of the Feces and upon Bacteria and Animal Parasites in the Gastro-intestinal Tract, which were mainly written by him. I am also indebted to Dr. G. Morton Illman, my clinical assistant at the Samaritan Hospital, for aid in getting up the section on The Blood in Gastro-Intestinal Diseases. The clear and succinct lecture on Diseases of the Rectum and Anus has been very kindly contributed by that well-known proctologist, Dr. Collier F.

Martin, instructor in Rectal Diseases at the Philadelphia Polyclinic.

To my friend and former teacher, Prof. C. A. Ewald of Berlin, and to Prof. Sidney Martin of London I am under particular obligations for permission to reproduce a number of choice illustrations from works written by them, also to several other medical friends and to various makers of surgical instruments for the use of electrotypes illustrating special apparatus or other objects of interest. Specific credit is given under each illustration.

Messrs. E. B. Treat & Co. of New York, the publishers of this volume, are entitled to praise for the very creditable dress in which it appears and for the courteous assistance which they have rendered me at every stage of the work.

BOARDMAN REED.

PHILADELPHIA, PA.,
August, 1904.

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PART I

**ANATOMIC, PHYSIOLOGIC,
CHEMIC, AND DIAGNOSTIC DATA**

DISEASES OF THE STOMACH AND INTESTINES

LECTURE I

ANATOMY OF THE DIGESTIVE TRACT

FOR the proper recognition and treatment of enlargements, contractions, or displacements of the digestive organs, and, indeed, of their disorders generally, it is important to have a perfect understanding of their normal size and position as well as of their relation to each other. Without attempting to go fully into the anatomy of these organs I will present to you a brief summary of its essentials. Other elementary data, especially physiologic, will also be useful. Those of you who desire to study the subject thoroughly will of course refer to comprehensive works on the anatomy, histology, physiology, and physiologic chemistry of the digestive system, and the following account can therefore be very much condensed.

The digestive tract begins with the mouth and pharynx and the adjacent salivary glands. The tongue and teeth also play a large part in the processes of digestion.

The pharynx is behind the nose in its upper part and behind the mouth in its lower part, these cavities opening directly into it. It extends from the base of the skull above to the lower part of the cricoid cartilage opposite the sixth cervical vertebra. At this point it joins the esophagus, forming with the latter a continuous muscular tube lined with mucous membrane. It measures about $4\frac{1}{2}$ inches (11.3 cm.) from above downward. It is widest opposite the cornua of the hyoid bone and narrowest at its point of juncture with the esophagus. In its

lower part the cavity is entirely obliterated, the walls being in contact except during the act of swallowing.

The esophagus extends from the lower end of the pharynx to the cardiac orifice of the stomach. Its length is from 9 to 10 inches (22.86 to 25.4 cm.). It is narrowest at its junction with the lower end of the pharynx and is again constricted where it passes through the diaphragm to enter the stomach opposite the upper border of the eleventh dorsal vertebra. At



FIG. 1.—Cross section of squamous epithelium from the mucosa of the tongue.

its beginning, opposite the sixth cervical vertebra, it lies in the middle line in front of the vertebral column. It then follows the cervical and dorsal curves of the vertebral column, but curves also to the left in the neck, and finally, after passing along the right side of the thoracic aorta, turns again to the left in passing through the diaphragm.

Abdominal Cavity.—In this are included the stomach and small and large intestines as well as the liver and pancreas. All of these digestive organs as well as the spleen, which is included among the latter by some writers, and the omentum, kidneys, and various other structures are invested with a thin



FIG. 2.—Coronal section of the trunk (from a model in the museum, University College). 1, heart; 2, stomach in transverse section; 3, gall-bladder; 4 and 6, duodenum; 5, liver; 7, colon; 8, diaphragm; 9, lungs.—From Sidney Martin's "*Diseases of the Stomach*."

serous membrane called the peritoneum. This lines the abdominal walls and covers the viscera, forming a closed sac.

The stomach is a pear-shaped pouch lying in the epigastrium and left hypochondriac regions. About one-sixth only of it is on the right of the median line. When normal its size is about 12 inches (30.48 cm.) long and 4 to 5 inches (10.16 cm.—12.70 cm.) wide in vertical diameter, the antero-posterior diameter being a little less. It weighs 4 to 5 ounces (113.4 to

32 ANATOMIC, PHYSIOLOGIC, CHEMIC, DIAGNOSTIC DATA

141.75 grms.) and in health its average capacity is a little more than three pints (1600 to 1700 c. c. according to Ewald). The stomach has two orifices: the cardiac where the esophagus enters it, and the pyloric where it joins the duodenum; also two borders, the greater and lesser curvatures, and two surfaces, the anterior and posterior. Its large end is called the fundus and its smaller end the pyloric portion. The cardiac opening lies about 4 inches (10.16 cm.) behind the seventh left chondrocostal junction, at about the

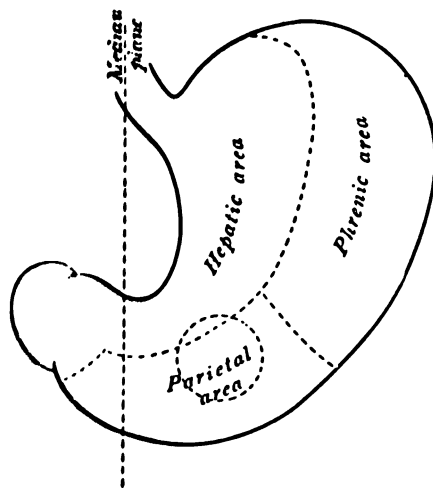


FIG. 3.—Stomach in natural position, showing structures in contact with the anterior surface. The circle represents the position of the duodeno-jejunal flexure.—Thane.

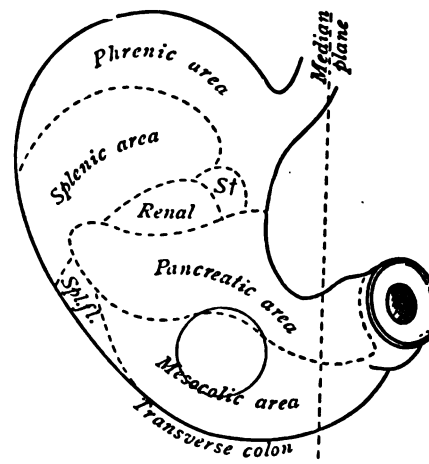


FIG. 4.—Posterior surface of the stomach and its relations. St=supra-renal body. Spl.fl.=splenic flexure of colon. The circle shows position of the duodeno-jejunal flexure.—Thane.

level of the eleventh dorsal vertebra. It is a little above and behind the apex of the heart. It is fixed in its position there by the phrenico-gastric ligaments and the esophagus.

The pyloric is lower and nearer the surface than the cardiac end and is very movable. It is normally to the right of the median line between the sternal and parasternal lines opposite the upper border of the first lumbar vertebra, and between

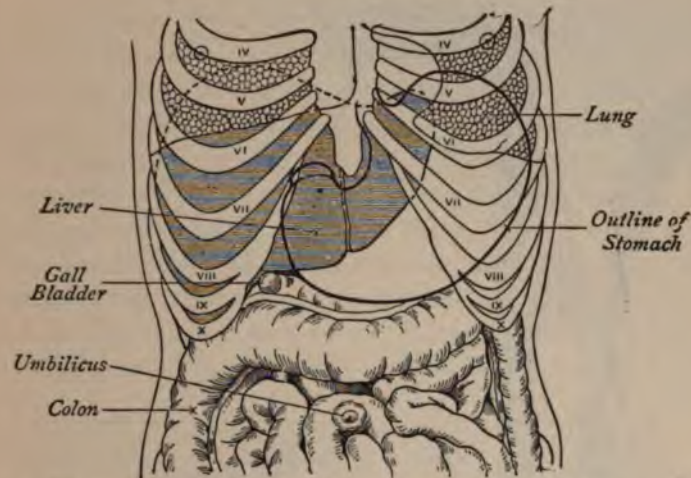


FIG. 5.—Position of the organs in the upper part of the abdomen. Front view. The highest points of the liver and fundus are somewhat too high in the figure.—After Luschka.¹

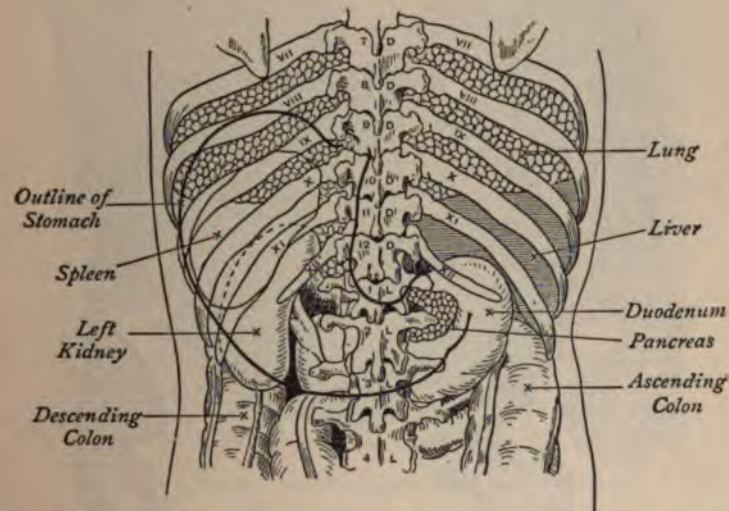


FIG. 6.—Position of the organs in the upper part of the abdomen. Back view.—After Luschka.

¹ H. von Luschka, "Die Lage der Bauch-Organen des Menschen." Carlsruhe, 1873, Plates I and II.

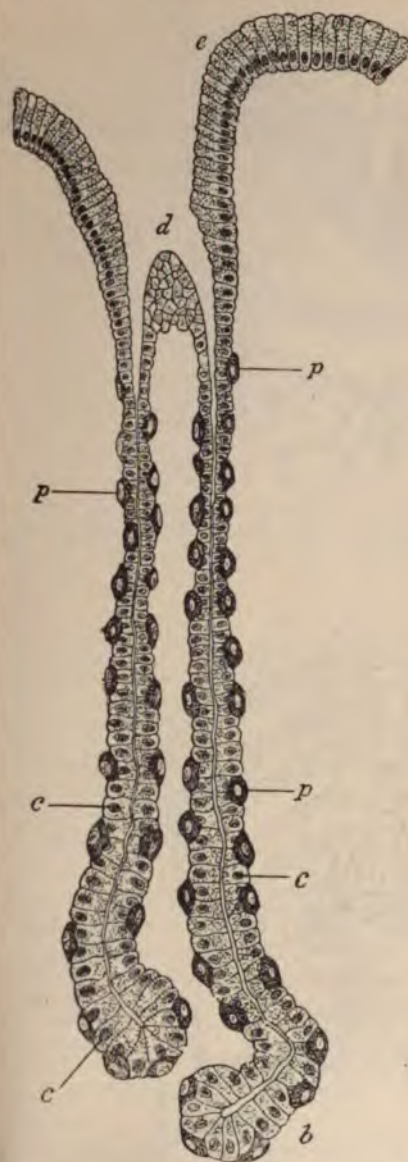


FIG. 7.—A cardiac gland from the dog's stomach (Klein and Noble Smith). *d*, mouth of the gland; *b*, fundus of one of the tubules; *e*, epithelium; *p*, parietal cells; *c*, central cells.—From Sidney Stein's "Diseases of the Stomach."

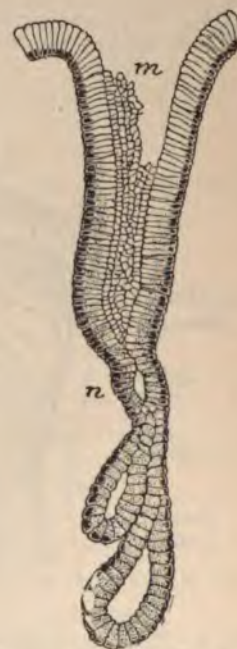


FIG. 8.—Pyloric gland from a section of the dog's stomach; *m*, mouth; *n*, neck.—Eberstein.

the ends of the seventh ribs in front. It is a little to the right of the tip of the ensiform cartilage, between the latter and the edge of the ribs. The lesser curvature is 3 to 5 inches (7.62 cm.—12.7 cm.) long, having a concavity looking upward and to the right, and lies through most of its course normally in apposition with the left edge of the vertebral column. The greater curvature begins a little to the left of the sixth costosternal articulation and is four times as long as the lesser curvature. It rises to the fourth intercostal space, that is a little above the level of the apex of the heart, and thence follows a nearly circular direction downward and to the left, to a point



FIG. 9.—Glands from the cardiac end of the stomach.

near the lower border of the seventh rib, where it curves to the right across the middle line, normally, to a point a little lower than midway between the tip of the ensiform cartilage and the umbilicus, and terminates at the pylorus. The diameter of the

pyloric opening is about one-half inch (1.3 cm.), this being the narrowest part of the digestive canal.

The gastric glands comprise three varieties of secreting cells, viz.: 1, the *cylindric cells* which form the mucous layer of the lining membrane and extend part of the way into the gland ducts: 2, cuboidal cells with a granular protoplasm and spherical nucleus called by Heidenhain *chief* or *central cells*; and 3, the *border, parietal* or *oxyntic cells*. The first secrete



FIG. 10.—Glands from pyloric end of stomach.

mucus only, so far as known; the second, according to Heidenhain and others, secrete the ferments of the gastric juice, pepsinogen and rennin zymogen; and the third are now believed, upon the same authority, to secrete the HCl only. The border cells which furnish HCl are found chiefly in the middle part of the stomach with a less number in the fundus, and the chief or central cells, which furnish the gastric ferments, predominate in the pyloric region; indeed, according to some

authorities, these are the only secreting cells in the pyloric portion, though both kinds of cells exist in the gland tubules of the fundus.

THE MINUTE ANATOMY OF THE STOMACH

The minute anatomy of the stomach was exhaustively studied by Mall in a paper published in vol. i. of the Johns Hopkins Reports, entitled "The Vessels and Walls of the Dog's Stomach," and I cannot do better than reproduce here the summing up which he therein makes of his most important investigations:

Conclusions.—1. "From a histologic standpoint the mucous membrane of the stomach may be divided into three zones—the pyloric, with no border cells; the middle, with many border cells; and the fundus, with but few border cells.

2. "Digestion of the different portions of the mucous membrane with weak HCl shows that the middle zone digests most easily, the fundus less quickly, and the pyloric, as a rule, not at all. Assuming that the rapidity of digestion of the different portions is in proportion to the quantity of pepsin present, it makes it probable that most pepsin is formed in the middle zone. Although it has been proved that pepsin is formed in glands which do not contain border cells, in general it may be stated that the amount of pepsin formed by the different glands is in proportion to the number of border cells.

3. "*The degree of acidity* of the mucous membrane is in proportion to the number of border cells present. It is reasonable to suppose that the formation of acid in any portion of the stomach aids materially in the formation of pepsin in the same part. This is very essential, because acid favors the formation of pepsin from pepsinogen. Since border cells are only with the greatest difficulty digested in acid, we cannot ascribe to them the power to secrete pepsin; and since the morphology of the central cells varies during digestion and rest, and they are so easily digested upon the addition of acid,

we must conclude with Heidenhain that the former are probably concerned in the production of acid and the latter in the production of pepsin.

4. " When the stomach is forcibly distended it is found that the dilatation is mostly at the expense of the fundus. This seems also to be the case when the stomach is naturally filled with food. Although the middle zone is practically not stretched when the stomach is filled, distention seems to favor circulation through this part, because the blood-vessels are more easily injected in a moderately distended, than in an empty, stomach.

5. " In the intestine it is found that the longitudinal and circular muscle-fibers are antagonistic. In the stomach the pyloric valve is closed, after the muscle-cells are dead, by a fold of mucous membrane being thrown into the lumen. This may take place in a living stomach. A contraction of the circular muscle tends to strengthen this valve, while the contraction of the longitudinal muscle tends to weaken it, because with the contraction of the longitudinal muscle there is always an accompanying relaxation of the circular muscle. Under ordinary circumstances it seems as though the stomach reduced its lumen by simultaneous contraction of both longitudinal and circular muscle-fibers. What complex motions take place during peristalsis are absolutely unknown. It is, however, a remarkable fact that a bundle of the circular fibers (oblique fibers) are parallel with the longitudinal fibers, which are increased in number in the middle zone. A solution of this problem seems within the range of experimentation.

6. " **The Blood-vessels of the Stomach.**—*The celiac axis* supplies, besides the stomach, also the spleen and the liver. With a given pressure within the aorta, variation in the resistance in the capillaries of the spleen and the liver will have a marked effect upon the circulation through the stomach. The portion of the stomach (middle zone) supplied by the gastric artery is to a less extent under the control of these side influences than is that which is supplied by arteries arising from the

main branches to the spleen and to the liver. It must be again stated that there are, in all probability, many other influences which play most important parts in the distribution of blood.

7. " Around *the two curvatures* of the stomach there is a complete circle of anastomosis, which has a tendency to equalize the pressure in the arteries penetrating the muscle-walls. But the anastomoses arising therefrom have only a tendency to make gradual gradations, and not an equal pressure throughout. The additional set of anastomoses within the submucosa are, again, not sufficient to equalize the flow throughout the whole mucosa. After ligating arteries, as well as by examining the mucous membrane, during digestion and rest, it is found that no sharp lines can be drawn.

8. " The blood-vessels are arranged in such a manner that from any portion of the submucosa about one-fourth of the blood may go to the muscle-coats and three-fourths to the mucosa. It is therefore probable that when the flow is poured to one side it is diminished to the other, and vice versa. There is, however, a tendency to equalize this by the submucous anastomoses.

9. " Since there is but one set of arteries to the mucosa, there must be but one sort of circulation, which may vary in degree only. Within the mucosa the arrangement is such that the portion of the gland which is deepest receives the blood richest in O. The mucous membrane, omitting the muscularis mucosæ, lies between two venous plexuses. Contraction of the muscle-fibers between the glands and those of the muscularis mucosæ should diminish the volume of the mucosa. This would have a tendency to empty the glands, as well as to press blood from the two venous plexuses, especially the lower. Whether or not there is a force within the mucosa which can augment the circulation seems at present impossible to determine by experiment. The arrangement of the parts is very suggestive.

10. " **The Veins and Lymphatics.**—The rich plexus of veins within the submucosa is sufficiently large to hold

a considerable quantity of blood. This must be the case when the valves within the veins coming from the stomach are temporarily closed. When the valves are closed, a contraction of the circular muscle is sufficient to drive all the blood from the underlying veins. It is therefore possible that a rhythmical contraction in any part of the stomach may favor the circulation through its walls.

11. "The arrangement of the lymphatics is much the same as that of the veins, and the foregoing consideration (10) applies equally well to them. When we consider the resistance to be overcome while the lymph passes through so many networks before the cisterna chyli is reached, it makes it plausible to state that the circulation is favored by muscular contraction.

12. "Since the blood which leaves the stomach must pass through the capillaries of the liver, it is necessary that it be constantly under a comparatively high pressure. This pressure is also dependent upon the spleen and the intestine. If the pressure is high, a regurgitation into the stomach is impossible on account of the presence of valves.

13. "In a stomach in which the vessels are all equally distended the rapidity of circulation in the celiac axis would be 263 times that in the capillaries. The area of the section of the celiac axis is 0.0592 square cm.; the immediate branches to the stomach, 0.0348 square cm.; to the spleen and liver, 0.0244 square cm. All the capillaries of the stomach: mucosa, 6.4524 square cm.; muscle-coats, 2.7214 square cm.; total, 9.1738 square cm.; $9.1738 \div 0.0348 = 263$.

"A like estimation shows that the rapidity of circulation in all the capillaries is 1-63 of that in the arteries penetrating the muscle-walls; while if the capillaries of the muscle-walls are excluded, the rapidity in the capillaries of the mucosa rises to 1-44.

"Considering the glands on an average 0.05 cm. long and 0.003 1-3 cm. in diameter, excluding the necks, the area of all the glands would be 8671 square cm., or thirty-eight times the area of mucous membrane. A like estimation of the capil-

laries, considering each capillary 0.04 cm. long, gives for them a total area of 1718 square cm., or $7\frac{1}{2}$ times the mucous surface. The secreting surface is five times that of the blood-supply." (See Fig. 98, page 826.)

THE ANATOMY OF THE INTESTINES, LIVER, ETC.

The intestinal canal is about 30 (914.4 cm.) feet long, extending from the pylorus to the anus. About 25 feet or upwards of four-fifths of it constitute the small intestine—the

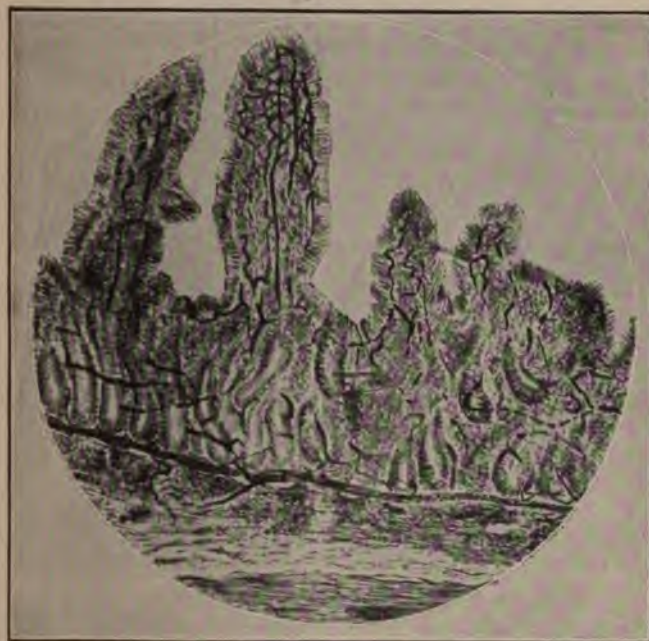


FIG. 11.—Injected intestine showing central lacteal and arrangement of capillaries in villus.

duodenum, jejunum, and ileum—the remainder comprising the cecum, colon, and rectum.

The duodenum, 10 to 12 inches (25.40 cm.—30.48 cm.), is the widest part of the small intestine, being $1\frac{1}{2}$ to 2 inches (3.84 cm.—5.08 cm.) in diameter. It curves underneath the pancreas and lies behind the transverse colon. It is the most

fixed part of the small intestine, though its first portion, about 2 inches (5.08 cm.) long, is more movable than any of the other four parts into which it is usually divided. The remainder of the small intestine—including the jejunum and ileum—follows no definite or constant course, its folds appearing now here and now there, and ends at the juncture with the cecum in the right iliac fossa, the entrance being guarded by the ilio-cecal valve.

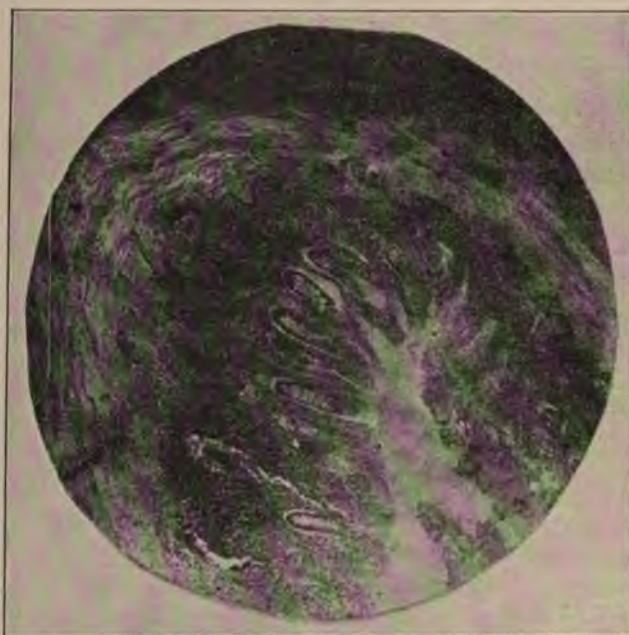


FIG. 12.—Glands and lymphoid tissue from the appendix vermiformis.

The **cecum**, or head of the colon, is about $2\frac{1}{2}$ (6.35 cm.) inches long by 3 inches (7.62 cm.) in breadth. It gives origin to the **appendix vermiformis**, which usually comes off on the inner and posterior side near the ilio-cecal valve and varies in length from 1 to 6 inches (2.54 cm.--15.24 cm.) averaging about 4 inches (10.16 cm.). It varies much also in width,

but averages about one-fourth inch (.63 cm.). The appendix is most frequently twisted upon itself and usually points toward the spleen lying between the end of the ileum and its mesentery, but sometimes lies behind the cecum, ascending parallel with it.

The colon includes the ascending, transverse, and descending portions. The first and third usually have a vertical course

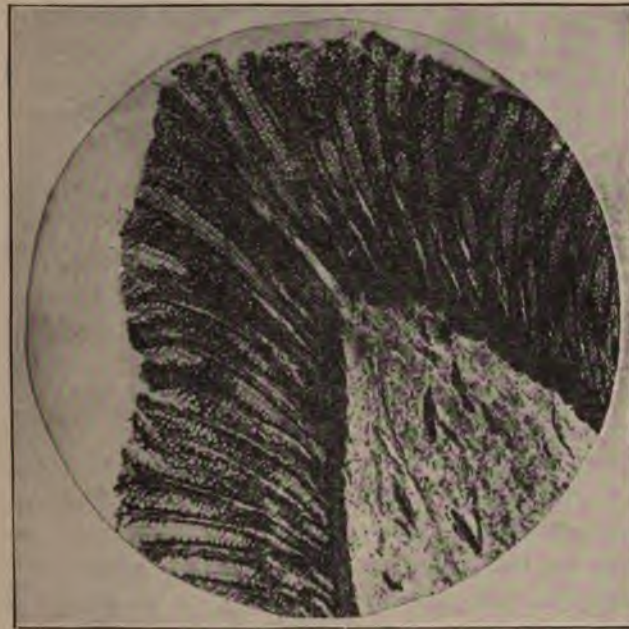


FIG. 13.—Goblet cells and glands from the colon.

in the adult, and the second a nearly horizontal one, but has several curves, including a marked convolution near its left flexure. The usual length of the ascending portion from the cecum to the hepatic flexure is 8 inches (20.32 cm.). The transverse portion averages 20 inches (50.80 cm.) in length, but varies greatly in different cases. It is also the most movable portion of the colon and is very frequently displaced downward. The descending portion from the splenic flexure to the beginning of the sigmoid flexure is usually $8\frac{1}{2}$ inches

44 ANATOMIC, PHYSIOLOGIC, CHEMIC, DIAGNOSTIC DATA

(21.62 cm.). This is the most fixed part of the colon. The ascending colon is somewhat narrower than the cecum and both the transverse and descending portions are smaller than the ascending. The transverse portion of the colon is usually in apposition with the stomach, having its convexity forward as well as slightly upward under normal conditions.

The sigmoid flexure begins at the termination of the descending colon in the left iliac fossa, and curving to the right toward the middle line, joins the rectum at the point where the meso-rectum ceases, opposite the third sacral segment in the median line. The sigmoid loop averages $17\frac{1}{2}$ inches (44.48 cm.) in length and lies mostly in the pelvis.

The rectum, beginning at the termination of the sigmoid, is usually divided arbitrarily into three portions, the first portion according to that division being included here, following the description of Morris, in the sigmoid loop. The remaining portions constitute the rectum proper and extend from the third piece of the sacrum to the anus. The first of these portions follows the course of the sacrum and coccyx terminating at the tip of the latter, and is $3\frac{1}{2}$ inches (8.92 cm.) long; the second (formerly called the third) extending thence to the anus, turns backward and downward and is about $1\frac{1}{2}$ (3.84 cm.) inches long.

The cecum, transverse colon, and sigmoid flexure are wholly covered by the peritoneum; the second, or lowest, portion of the rectum has no peritoneal attachment at all.

Structure of the Stomach and Intestines.—The walls of the stomach as well as of the small and large intestine comprise four coats, a peritoneal or serous, a muscular, a submucous, and a mucous coat. In the stomach the muscular coat consists of three layers, a longitudinal, a circular, and an oblique. In the intestines the muscular coat has two layers, an external longitudinal and an internal circular layer, the latter being the thicker of the two. The mucous layer in both stomach and intestines is lined with cylindric epithelium. On the other hand, the mucous membrane in the esophagus, pharynx, and

mouth is covered by a stratified squamous epithelium. The mucous membrane in the upper respiratory tract is, for the most part, lined with ciliated columnar epithelium. The comparatively small olfactory region in the nose has an unciliated columnar epithelium. Unciliated columnar epithelial cells, therefore, found in the vomit or wash water of the stomach in any considerable numbers, must have had their origin in that viscus except when there has been a possibility of regurgitation from the duodenum; squamous or ciliated columnar epithelial cells, found in fluids coming from the stomach, may be safely declared to have had their origin in the regions above and to have been swallowed.

The liver is situated on the right side of the abdominal cavity, directly underneath the diaphragm, occupying the right hypochondriac and epigastric regions and extending commonly into the left hypochondriac region. In front it is in apposition with the fifth, sixth, seventh, eighth, and ninth costal cartilages, and to the left it is in contact with the anterior abdominal wall below the sternal notch (Morris). On the right side it extends from the seventh to the eleventh rib. Its posterior surface is opposite the ninth, tenth, and eleventh dorsal vertebræ. It is a movable organ, sinks with each inspiration, and is liable to be permanently displaced, especially downward. A deep inspiration in the standing position forces the lower border below the ribs, but when the patient is recumbent the anterior border is usually half an inch above the last rib. At the left it extends to a point $1\frac{1}{2}$ inches (3.84 cm.) beyond the left border of the sternum at the level of the fifth rib. In front, in the median line, its lower border is half-way between the xiphoid cartilage and the umbilicus. Its upper border, having a slight concavity upward, reaches in the mammary line on the right side to the level of the fifth rib. The under surface of the left lobe is directly over the cardiac end and a part of the anterior wall, of the stomach. The right lobe covers the right kidney and the hepatic flexure of the colon, as well as the descending second part of the duodenum. The quadrate

lobe of the liver is over the pyloric end of the stomach and the first ascending part of the duodenum.

The pancreas lies transversely across the body, behind the stomach, in the epigastric and left hypochondriac regions opposite the first and second lumbar vertebræ. It measures usually 5 to 6 inches in length (12.20 to 19.24 cm.) and is half an inch to one inch thick (1.27 to 2.54 cm.). Its weight is from 2½ to 3½ ounces (77.72 to 108.82 grms.). The pancreas has commonly been divided into four portions: head, neck, body, and tail; the head being at the right end, around which the second part of the duodenum curves, and the tail at its left extremity where it comes into contact with the lower part of the inner surface of the spleen. The anterior surface of the pancreas is somewhat concave, corresponding with the convexity of the posterior surface of the stomach, with which it is in contact. The posterior surface is in apposition with the aorta, the superior mesenteric vessels, and the crura of the diaphragm. These various structures separate the pancreas from the spine. The left kidney and suprarenal capsule are also in direct apposition with the posterior surface of the left part of the body of the pancreas. The inferior surface is bounded below by the fourth part of the duodenum and the beginning of the jejunum. The head of the pancreas bends somewhat downward and is in contact behind with the common bile duct, the vena cava, the left renal vein, and the aorta. In front of the head of the pancreas are found the superior mesenteric and pancreatico-duodenal vessels and the transverse colon. The duct of the pancreas is called the canal of Wirsung, and runs from left to right nearer the posterior surface, turning in the head downward, backward, and to the right to meet the common bile duct. With the latter it passes obliquely through into the duodenum, though occasionally the canal of Wirsung opens by itself into the latter part of the intestine. There is also usually an accessory pancreatic duct known as the duct of Santorini, which opens separately into the duodenum about one inch above the other opening.

LECTURE II

THE NERVE SUPPLY OF THE DIGESTIVE ORGANS AND THE RELATIONS OF THE SPINE TO THE VASO-MOTOR NERVES

ACCORDING to Morris¹ the nerves supplying the stomach are the two pneumogastrics and the sympathetic. The right vagus passes over the posterior surface and the left supplies the anterior. The stomach is intimately connected with the sympathetic system of nerves through the solar plexus. The nervous supply of the intestines is from the superior mesenteric plexus and lower part of the solar plexus. The branches follow the blood-vessels forming Auerbach's and Meissner's plexuses.

The anatomy and physiology of the nervous system are by no means yet fully worked out and especially with regard to the vaso-motor nerve fibers supplying the viscera the work of investigation is still going on, while the results of different physiologists are not always in accord. In these lectures I shall not attempt to go deeply into the details of such investigations, quoting the views of the different authorities and the arguments by which they are upheld, but shall simply give you in brief the facts which seem fairly well established.

Secretory Nerves.—It is both maintained and denied that there are special secretory nerves distributed to the glandular structures, but Pawlow and his pupils² seem to me to have finally proved beyond question that there are in the yagi, apart

¹ "Human Anatomy," by Henry Morris, M. A. and M. B., P. Blakiston's Son & Co., Philadelphia, 1898.

² "The Work of the Digestive Glands," by Professor J. P. Pawlow, J. B. Lippincott Company, Philadelphia, 1902.

from the vaso-motor fibers, nerve fibers the stimulation of which produces a secretion of gastric juice.

It had long before been accepted as a settled fact that the salivary glands at least are supplied with a special secretory nerve, though this also is now disputed in some quarters. Pawlow brings forward results of experiments which tend to show that there are probably also nerves whose particular function it is to inhibit secretion. Nature displays a wonderful plenitude of resources and whatever structure or combination of structures, however intricate, can aid in performing any function, is generally supplied.

The Vaso-Motor Nerves and the Spine.—My preceptor in medicine, the late Dr. Matthew J. Grier, was accustomed thirty-five years ago to apply mild galvanic currents through the points of emergence of the spinal nerves on either side of the spinal column with one electrode stable over the stomach, and in this way produced highly favorable results, not only upon symptoms referred to the spine itself and affections of the general nervous system, but also in many cases upon disease in the parts to which such nerves were distributed. During the past twenty-five years I have confirmed the value of the method in many hundreds of cases.

Professor H. C. Wood used to teach the usefulness in certain chronic diseases of alternate hot and cold water douches to the spine, and various applications of heat and cold to the spine are in common use. More recently much success has been claimed for various methods of stimulating the spinal nerves near their emergence from the spine by mechanical devices designed to produce pressure with vibration and also by a species of massage or finger pressure over these parts, continuous or intermittent accordingly as contraction or dilation of the peripheral vessels may be desired. Dr. John P. Arnold in particular is an enthusiastic advocate of this latter method.¹

The clinical successes achieved in all these ways are confirmatory of the conclusions of physiologists that vaso-motor

¹*Int. Med. Mag.* for May, July, and August, 1903.

nerve fibers pass out from the spinal cord with the spinal nerves as well as with the pneumogastrics and some of the other cranial nerves, and are distributed thence to the periphery of the body and to the viscera.

Those nerves which control the caliber of the arterioles include the vaso-constrictors, stimulation of which contracts the vessels, and the vaso-dilators, which have an opposite effect. Both of these are efferent nerves which carry impulses outward to their peripheral endings from the vaso-motor center in the medulla.

Vaso-constrictors and vaso-dilators pass from their respective portions of the vaso-motor center down through the anterolateral columns of the spinal cord and through centers in the anterior horns of the latter outward to join the anterior bundles of the spinal nerves, thence to ganglia of the sympathetic chain of nerves, and again to the vessels which they supply.

There are also other vaso-motor fibers which are afferent or ingoing nerves called the reflex constrictors and reflex dilators. Both the latter convey sensory impressions from the periphery of the body or the viscera to certain groups of cells in the ganglia in the posterior branches of the spinal nerves and thence into the cord passing upward in the anterolateral columns of the latter to the vaso-motor center in the medulla, or through the ganglia of the cranial nerves more directly to the same center. Excitation of the peripheral endings of the reflex constrictors or reflex dilators produces a stimulation of the corresponding part of the vaso-motor center with a resulting contraction or dilatation respectively of the vessels in the peripheral regions from which such nerves take their origin, whether these are in the external parts or the viscera.

The afferent vaso-motor nerves are near enough the surface, before passing into the spinal cord, to be influenced by heat or cold, pressure, or by vibration whether produced by electricity or special mechanical devices when applied over them on either side of the cord.

Course and Direction of the Spinal Nerves.—The follow-

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ing, quoted from Morris¹ will make clearer the course of the spinal nerves. The table showing the distances traveled by the nerves (especially the lower ones) before emerging from the spinal column will be of especial interest and practical value to those of you who treat the viscera through the spine:

"From their superficial origin, both anterior and posterior roots proceed towards the intervertebral foramina, and unite near the outer limits of the foramina into single trunks. The ganglia on the posterior roots are placed, in the case of the majority of the nerves, within the foramina immediately internal to the point of junction of the two roots. The ganglia of the first and second cervical nerves are placed on the laminae of the atlas and axis. The ganglia of the (first and second) sacral and coccygeal nerves are placed within the spinal canal.

"The roots of the first spinal nerve ascend slightly to reach the interval between the atlas and the occipital bone.

"The second and third nerves pass horizontally outwards, the fourth passes obliquely downwards and outwards, and the remaining nerves pass out with increasing degrees of obliquity, the intraspinal course of the nerve-roots increasing in length as the series is followed downwards.

"It follows from the above statement that the lower nerve-roots are directed almost vertically downwards, and as the spinal cord ends at the level of the second lumbar vertebra, while the series of intervertebral foramina is continued to the lower end of the sacrum, the nerve-roots passing within the vertebral canal beyond the cord form a great sheaf of fibers, the cauda equina. The distance of the points of emergence (superficial origins) of certain of the nerves from the corresponding intervertebral foramina is given in the following table. This table gives the measurements made by Testut in a subject of eighteen years. The length of the spinal cord was in this case forty-one centimeters."

¹ "Human Anatomy," Blakiston's & Co., Philadelphia, 1898.

YASBU BBA

					Right Side mm.	Left Side mm.
Third pair of cervical nerves	.	.	.	.	18	17
Fifth " " "	.	.	.	.	25	25
First " thoracic "	.	.	.	.	33	32
Fifth " " "	.	.	.	.	47	47
Tenth " " "	.	.	.	.	68	68
Twelfth " " "	.	.	.	.	111	110
First " lumbar "	.	.	.	.	114	114
Second " " "	.	.	.	.	138	134
Third " " "	.	.	.	.	151	151
Fourth " " "	.	.	.	.	163	164
Fifth " " "	.	.	.	.	181	180
First " sacral "	.	.	.	.	188	188
Fifth " " "	.	.	.	.	280	280

Remembering that a millimeter is equal to one-twenty-fifth of an inch, or 10 mm. to nearly half an inch, it will be seen from the foregoing table that the fifth cervical nerves leave the spine an inch below their origin in the cord, and the fifth sacral nerves eleven inches below their point of origin.

Points of Emergence from the Spine of Special Vaso-Motor Nerves.—The cerebral blood-vessels are said to be more or less under the control of vaso-motor centers in the spinal cord chiefly in its second and third dorsal segments. Efferent fibers pass from these through the sympathetic nerves to the superior cervical ganglion. From this both constrictor and dilator fibers pass along the internal carotid artery to the vessels in the brain.

Vaso-constrictor nerve fibers for the salivary glands have their origin in the second and third segments of the thoracic part of the spinal cord, enter the sympathetic chain, pass on to the superior cervical ganglion, and thence are distributed to the parotid, submaxillary, and lingual glands. Vaso-dilator fibers for the parotid gland arise in the nucleus of the ninth cranial nerve and accompany the latter, passing through the jugular foramen to the otic ganglion, whence they proceed along the inferior maxillary branch of the fifth nerve and its auriculo-temporal branches to the gland.

Vaso-dilator fibers originating in the nucleus of the seventh

or facial nerve follow the latter and thence pass through the chorda tympani to the submaxillary ganglion, emerging from the cranium through the stylo-mastoid foramen. From the submaxillary ganglion dilator fibers are distributed to the submaxillary and lingual glands.

Vaso-constrictor fibers for the stomach emerge from the spine with the fifth, sixth, seventh, eighth, and ninth dorsal nerves through the intervertebral foramina and pass with the visceral nerves to the semilunar ganglion; thence along the blood-vessels to the vessels of the stomach itself.

Vaso-dilator fibers originate in the nucleus of the tenth or pneumogastric nerve and proceed by the way of the semilunar ganglion to the gastric blood-vessels.

Vaso-constrictor fibers for the small intestines pass from those segments of the spinal cord from the sixth dorsal to the second lumbar, through the visceral nerves to the solar plexus, and thence to the blood-vessels of the duodenum, jejunum, and ileum.

The dilator nerves of the same part arise in the nucleus of the pneumogastrics and go to the solar plexus. Thence they are distributed to the blood-vessels of the small intestines.

The vaso-motor nerve supply of the liver has the same origin as that of the small intestine, and that of the pancreas and spleen varies but slightly from the same.

The vaso-motor mechanism of the colon has in part the same and in part a different origin from that of the small intestines. The constrictor fibers arise in the same part of the cord—sixth dorsal to the second lumbar segment—and enter the inferior mesenteric ganglion before their distribution to the blood-vessels of the various portions of the large bowel.

Dilator fibers for the colon originate in the same segments of the cord as well as in the nucleus of the pneumogastrics. They pass via the visceral and pneumogastric nerves to the solar and inferior mesenteric ganglia, and thence to the blood-vessels of the colon.

The sigmoid flexure and rectum receive vaso-constrictor nerve

fibers which, arising in the tenth dorsal to the fourth lumbar nerve-roots, pass to the hypogastric plexus, and thence along the hypogastric nerves to the vessels of the parts. The dilator fibers for the vessels of the same region arise much lower down, in the first to the fourth sacral segments of the cord. They proceed then to the corresponding sacral ganglia, and thence through the visceral branches of the sacral nerves to the vessels of the sigmoid flexure and rectum.

It is noteworthy that the vaso-constrictors for the sigmoid flexure and rectum, and also those for the principal genital organs of both sexes, come from the lumbar nerve-roots, while the vaso-dilators for the same two sets of organs come from the sacral plexus. This accounts for the often observed intimate sympathy between the lower bowel and the sexual apparatus. Whenever one is disturbed the other is rarely normal.

LECTURE III

THE PHYSIOLOGY OF DIGESTION, ABSORPTION, AND DEFECATION

Salivary Digestion.—Digestion begins in the mouth with mastication and insalivation. These two processes are among the most important of those which prepare the food for assimilation. Their importance is little understood by the laity, and by no means sufficiently emphasized by writers upon diseases of the gastro-intestinal tract. Physicians do not always pay sufficient heed to them in their directions to patients concerning diet, etc. Man in his primitive condition was obliged to chew his food with unusual thoroughness because it was crude, coarse, very often tough and uncooked. With advancing civilization our cooks have been constantly endeavoring to lessen and lighten the work of the muscles of mastication and salivary glands, thereby increasing the labor of the stomach and intestinal glands and multiplying digestive maladies. Nature has so arranged matters that the act of mastication promotes the secretion of the salivary glands and possibly also that of the gastric, pancreatic, and intestinal glands by a reflex influence. The function of the salivary glands—the parotid, submaxillary, and sublingual—is to secrete the saliva. The latter is a thin liquid of alkaline reaction of the sp. gr. of 1,002-1,009. The quantity secreted in twenty-four hours is from 2 to 4 pints (946 to 1892 c. c.); Bidder and Schmidt say 1400 to 1500 c. c. The saliva contains a diastatic enzyme called ptyalin, which has the property of changing starch into a form of sugar, maltose, with usually a small amount of grape sugar. This conversion begins in the mouth during the act of chewing, and the longer the latter is continued the more com-

pletely is it effected. Usually, the process is merely commenced in the mouth, and when the gastric contents are not too highly acid, is carried further forward after the food reaches the stomach. Under normal conditions, when the percentage of HCl in the gastric juice is not too high, this salivary digestion or starch conversion goes on in the stomach for some thirty minutes or more when, under even the most favorable conditions, it is commonly terminated by the increasing acidity of the stomach contents. When the latter are exceedingly acid, as in marked cases of hyperchlorhydria, salivary digestion may be checked at once, and the conversion of the starch into maltose cannot then be completed until the contents of the stomach are passed on into the intestines, when normally the pancreatic juice, aided by the bile and intestinal juice, complete the process. However, when there is present in the stomach a marked excess of HCl, the pyloric outlet remains closed much longer than normal and the unconverted starch is subjected to the danger of fermentation for an exceptionally long period. Aggravated flatulency then results. Boas gives the following proportions of HCl and other acids as effective in checking or stopping entirely salivary digestion in the stomach :

	Checked by	Stopped by
Hydrochloric acid.....	.07 per cent.	.12 per cent.
Lactic acid .....	.1 " "	.15 " "
Butyric " }	.2 " "	.4 to .5 " "
Acetic " }		

The saliva serves other useful purposes in softening or pulpifying and lubricating the food, dissolving the salts in it, and imparting to it an alkaline reaction. The saliva, upon reaching the stomach, also stimulates the secretion of the gastric juice.

Gastric Digestion is performed by the gastric juice, an acid liquid of the sp. gr. of 1.002-1.003. It contains HCl, pepsin, and rennin (the milk-curdling ferment), and, as has been recently demonstrated, a small quantity of a substance which

has the property, to some extent, of emulsifying fats. No reliable data are at hand as to the total quantity of gastric juice secreted, but Grünwald estimated it at 1580 c. c., that is, about three pints. The normal percentage of HCl in the gastric juice has been variously estimated, but may be accepted as approximately 0.1 to 0.2. At the height of the digestion of a light breakfast, such as the test breakfast originally prescribed by Ewald, a little more than one-half of the HCl present should be in the free form and somewhat less than half combined with the proteid food. The HCl of the gastric juice has a decided antiseptic action for many bacteria, but, as should be carefully borne in mind, does not interfere at all with the development of the yeast germ, which is responsible for a large share of the usual gastric fermentation. Gastric enzymes exist primarily in the forms of pepsinogen and rennin zymogen, which in the presence of HCl are changed respectively into the active forms of pepsin and rennin. Pepsin, in the presence of sufficient free HCl, converts proteid or albuminoid food elements into the more soluble propeptones and peptones. Gelatin is also changed by this compound into gelatin-peptone, and elastine into elastine-peptone. Other mineral acids can be substituted for HCl and will enable the pepsin to effect the same changes, but much less efficiently; and in a still lower degree, lactic, acetic, and butyric acids are also capable of substituting the HCl. The rennin zymogen is the most constant constituent of the gastric juice, and in conditions of disease has been found to persist generally even after the entire disappearance of HCl and pepsin.

The property of rennin is to produce a light flaky coagulation of milk. It should not be forgotten in this connection that a denser coagulation may be produced in milk by HCl alone.

The motor function of the stomach is of the greatest assistance to the action of the gastric juice. The churning movements keep the contents in constant motion, and mix the gastric juice through all parts of the mass, bringing it into con-

tact with every portion of it, while the propulsive movements empty the stomach. The pylorus normally opens rhythmically every few minutes during digestion, and the more liquid contents are then expelled by contractions of the muscles of the antrum pylori. With lowered gastric motility digestion does not go on efficiently, even with a normal or excessive secretion of the HCl and pepsin. Indeed, an excess of HCl usually tends to a lessened peptone production. On the other hand, there may be a complete absence of secretion without serious disturbance of nutrition or great inconvenience to the patient, provided the gastric motility is well maintained, so that the stomach contents are promptly propelled into the duodenum, where the other digestive juices can have access to them.

It is noteworthy in this connection that an excessive secretion of HCl, which often causes a prolonged spasmodic closure of the pylorus with long-delayed emptying of the stomach, produces usually more serious symptoms, more distress to the patient in the beginning, and a greater number of important sequels in the end, than does a deficiency of the same secretion, provided always the latter fault is compensated for by an active gastric motor power and functionally efficient intestinal digestion. Experiments performed in Pawlow's laboratory indicate that the closure of the pylorus is determined by the reaction of the contents of the duodenum. When these are rendered acid by excessive acidity of the chyme, the pylorus closes by reflex action. When the duodenal contents again become neutral or alkaline, the pylorus opens to admit a fresh portion of chyme.

Intestinal digestion, in so far as is yet definitely known, is comprised in the action of the pancreatic juice, the bile, and the succus entericus or intestinal juice. The pancreatic juice is secreted by the pancreas and finds its way into the duodenum through the duct of Wirsung; the bile secreted by the liver and stored up in the gall-bladder flows through the cystic and common bile ducts and enters the duodenum commonly through the same opening as the pancreatic juice. Some recent inves-

tigators have reported evidences that an internal secretion of the spleen assists the action of the pancreatic juice, probably by converting the trypsin zymogen into the active proteolytic ferment called trypsin. All of the three digestive juices above described, which meet and perform their functions in the intestine, are more or less alkaline and gradually neutralize the acidity of the gastric juice. They are active in an alkaline, neutral, or slightly acid medium, but not in a highly acid one. Free HCl, even in small proportion, has been shown to inhibit pancreatic digestion. This helps to explain the injurious results to nutrition of an excessive secretion of HCl. All of these three secretions likewise have some fat-emulsifying power; this work is done chiefly by the pancreatic and intestinal juices, but goes on much more rapidly in the presence of bile. The secretion of the pancreatic juice in man is now believed to be continuous to some extent, accumulating in the excretory ducts of the pancreas between the digestive periods a small amount, but being secreted much more abundantly during digestion. Various kinds of stimuli, mechanical and chemical, are efficient in exciting the secretion of this juice, but the chief one is the presence of an acid chyme in the duodenum. The amount of the daily secretion of the pancreatic juice has never been accurately determined. It is the most active of all the digestive secretions. It combines the properties of both the saliva and gastric juice, having the power of converting starch into sugar or completing that process when partly effected in the stomach, and also has a greater proteolytic or albumin-digesting power than the gastric juice, besides the ability to emulsify fats and produce changes in milk analagous to, but not identical with, its coagulation by rennin.

The bile, a yellow or brownish liquid, is a continuous secretion from the cells of the liver. It is alkaline, and the quantity formed daily has been estimated at from 1 to 2½ pints (473 to 1182 c. c.). Bile is to be considered as an excretion as well as a secretion. It contributes somewhat to the processes of intestinal digestion, being a stimulant to the peristaltic

apparatus, and assists in maintaining the normal bowel functions besides aiding in the splitting up of the fats by forming soaps with the solid neutral ones. Antiseptic properties have been claimed for the bile, and though this claim has been disputed, it probably lessens somewhat the activity of certain of the intestinal bacteria. Bile also assists in the assimilation and absorption of fats.

Besides secreting the bile, the liver possesses other vitally important functions in the normal metabolism or tissue changes, including the destruction of poisonous substances introduced into the digestive system from without or formed within the body. All the blood from the digestive organs must pass through the portal vein and be brought into contact with the hepatic cells before passing on to the heart. According to the theory of auto-intoxication, now sufficiently well established, the liver is the great defender of the system against the numerous poisons constantly formed during the metabolic processes. Urea is now known to be produced largely, if not chiefly, in the liver. Moreover, glycogen is formed in the same gland from the digested carbohydrates as well as from proteid food, and is stored up there to be reconverted into sugar and then distributed to the system as needed. This peculiar function is believed to be possessed to some extent also by the muscles and perhaps other tissues.

Absorption.—Pure water is scarcely absorbed at all from the stomach, but diluted alcohol is freely absorbed, as are also solutions of the sugars when in a concentration of 5 per cent. or higher. Peptones are only slowly and with difficulty absorbed by the stomach. In the small intestine all the soluble products of digestion, peptones, sugars, and emulsified fats are readily and rapidly absorbed through the medium of the lacteals of the lymphatic system and in part directly into the blood. In the large intestine absorption is much less active and proceeds more slowly, but still takes place to a considerable extent. Hence the loss to the system of a too prolonged employment of colonic irrigation.

Absorption in the intestine takes place chiefly through the villi and the solitary glands. The former are limited to the small intestine, none of them being found in any part of the colon. The solitary glands are most numerous in the ileum, but many of them are also irregularly scattered throughout the various parts of the large intestine. Pohlman infers from the limited number of any specialized organs for absorption in the colon, and particularly in view of its well-known absorbing power, that its whole mucous membrane has the power of absorption, as is the case with that of the stomach for a limited number of substances. The villi and solitary glands are thus tersely described by Pohlman:¹

“The villi, little cone-shaped protuberances in the mucous membrane, have a dense network of blood capillaries just underneath their epithelial covering, while a lacteal duct occupies the center of the cone. The solitary glands have a dense lacteal plexus beneath the membrane and a limited supply of blood capillaries. All the blood capillaries of the intestinal tract are radicles of the portal vein, while the lacteal ducts and capillaries are radicles of the abdominal lymphatics. The villi, however, are the principal organs and carry the bulk of the peptones and sugars into the circulation directly, while the emulsified fats absorbed are poured by the way of the lacteals and abdominal lymphatics into the receptaculum chyli, and from there through the thoracic duct into the left subclavian vein.”

Everything ingested, excepting fats and water, must pass through the liver before it can be taken up for the uses of the body. Only a small amount of the fats are broken up into fatty acids and glycerin, the chief part of such food ingested being first emulsified and absorbed in that form. The large intestine is able to absorb not only digested foods, but also to some extent undigested nutriments such as solutions of albumin, etc. Hence the utility of nutritive enemas.

¹ Article on Absorption, Wood's "Reference Hand-Book," vol. i., New York, 1900.

Defecation.—The feces are what remain of the food and drink after all has been absorbed that should be. The process of absorption having gone on continuously, the ingesta, which are fluid throughout the whole course of the small intestines, gradually assume the solid form as they pass through the cecum and colon until by the time they have reached the sigmoid flexure they should be in the form of a putty-like semi-solid mass, and in passing through the rectum they normally become molded into the sausage form. In conditions of health there is usually a movement of the bowels—that is a discharge of feces from the rectum—once in twenty-four hours, although there may be two or three in the twenty-four hours, or one only in each two or three days in conditions which seem to approximate those of health. When the bowel movement occurs, as is most usual, in the morning, the feces accumulate during the night in the descending colon and are arrested in the sigmoid flexure by the superior sphincter of the rectum. When the accumulation is sufficient to make the act of defecation necessary, the pressure upon the superior sphincter causes the latter to yield and a portion of the feces enter the rectum. If this warning is unheeded the fecal matter returns to the sigmoid flexure, and this process may be repeated several times before the pressure becomes so urgent that it can no longer be resisted. In some cases, however, when the peristaltic action is less vigorous than usual, the repeated calls to stool may be disregarded and the rectum thus become tolerant of the accumulation of feces. Thus the rectum is gradually overdistended and weakened until a very obstinate form of constipation results. In the lower part of the rectum there is an internal sphincter in addition to the external sphincter at the anal orifice. The muscle forming the inner sphincter is an involuntary one, while the external sphincter, composed of striated muscular fibers, is to a large extent under the control of the will, though it may relax in spite of the will if the pressure upon it is exceedingly great. The innervation of the colon is in part from the sympathetic

and in part from the lower spinal nerves. The vaso-constrictor nerve fibers, as already described, rise from that part of the cord between the sixth dorsal and the second lumbar segment. The vaso-dilator fibers of the colon rise from the same part of the spinal cord and from the pneumogastrics. The vaso-constrictor nerves supplying the sigmoid flexure and rectum come from the tenth dorsal to the fourth lumbar segments of the cord, while the vaso-dilators for the same parts originate between the first and fourth sacral segments of the cord. Both motor and inhibitory nerve fibers supply the muscles of the rectum, some coming from the lumbar plexuses and others from the interior mesenteric and hypogastric plexuses of the sympathetic system. What has been called the defecation center is now usually located in the second segment of the lumbar part of the cord. There is also known to be a nervous connection between the cerebral centers and the muscles of the rectum.

Interference with normal defecation may arise from either atony of the peristaltic muscular apparatus leading to a deficiency of expulsive force, or from irregular spasmodic contractions of the circular muscular fibers producing what is now known as spastic constipation; also from displacements of the intestines or neighboring viscera, tumors, etc. This subject is discussed at length under the head of Constipation and also in Lecture LXIV. on Intestinal Obstruction.

PART II

METHODS OF EXAMINATION

LECTURE IV

THE INTERROGATION OF THE PATIENT

Importance of a Full History.—It is always advisable, when practicable, to obtain from patients detailed accounts of their past and present symptoms, with the chief facts in the family history. Indeed, this is often a very necessary preliminary, if you are to make such an examination as shall lead you to a correct diagnosis in any very obscure or chronic case of ill health.

Though this series of lectures deals predominantly with diseases and derangements of the organs concerned in the processes of digestion, you cannot be expected to know in advance that any individual case which claims your attention is a stomach or intestinal case. The fact that the patient thinks so by no means proves it. The real lesion may be elsewhere, and, even with the fullest possible history obtainable from the patient, you may sometimes be misled. You may be induced thereby to examine exhaustively the entire digestive tract, carrying out the tests of the gastric juice, feces, etc., without finding there the origin of the trouble, its seat being elsewhere; but you are much less likely thus to waste your time and put the patient to unnecessary expense, if you institute the most searching inquiries beforehand concerning all the functions and systems of the body.

Naturally the exigencies of a large practice will render it impracticable to examine minutely every part of every patient's body, to say nothing of analyses of the secretions and excretions and thorough examinations of the blood. But whenever a patient has long complained of symptoms which, being only temporarily relieved by remedies, point to some chronic lesion

or derangement in any part of the system, it is necessary to make a full and careful inquiry into his condition and antecedents. Let us suppose he complains of constipation, headache, and nervousness with insomnia—a very frequent combination—and that no permanent relief has been afforded by cholagogues, laxatives, sedatives, or hypnotics. Indeed, the hypnotics not only generally fail to do more than palliate temporarily, but often finally aggravate such cases. You may think of a possible brain lesion, such as a chronic meningitis, cerebral tumor (gumma), etc., but should also suspect, as very much more probable, a toxæmic neurasthenia resulting from a faulty diet and too little physical exercise, with probably excessive mental work, worry, dissipation, or sexual irregularities. You will sometimes find all of these factors combined, but any one of the latter group alone is frequently sufficient to produce the clinical picture.

In the case stated, the family history will tell you whether or not there is a tendency to gastro-intestinal disorders, for such a tendency is notoriously likely to be inherited, or whether the patient's forebears have had specially vulnerable nervous systems. The personal history, if fully elicited by skillful questioning, may reveal at least a suspicion of syphilis or tuberculosis, which would direct your inquiries and examinations particularly toward the brain, though even such a history would not exclude neurasthenia of autotoxæmic origin as the active cause of the trouble.

The less dexterous and expert a physician is in the technical arts which are indispensable to a good diagnostician, and the more deficient his training in, or facilities for, thorough laboratory work, the greater the help he may derive from an unusually full and minute account of the history and symptomatology of any case. The gastro-enterologist should be able usually to diagnose a well-marked type of gastric ulcer or acid gastric catarrh, for example, after making a physical examination and testing the stomach contents, even without having heard a word of the family or personal history or

symptoms; yet most specialists regularly obtain and record a full history, and you would do well, in doubtful cases at least (in new cases especially), to get all the help possible from the same source. Besides the name, age, residence, and occupation, ask the present weight of the patient, the best former weight, and how long a time the loss or gain has been going on. Inquire as to the health of the parents, or, if dead, the age and cause; also as to the health of brothers and sisters. Ask when the patient first began to be out of health and about previous acute illnesses. Note down systematically all the salient medical facts with which the patient is able to acquaint you, recording particularly the answers given regarding the state of the chief functions and the persistent or frequently recurring symptoms, before proceeding to make your examination.

The patient usually has his own theory as to the proper diagnosis, and will often try, though perhaps unconsciously, to impose this upon you by magnifying or emphasizing such symptoms as seem to bear it out, and minimizing, or even neglecting altogether, any mention of those referring to organs or functions which he deems healthy. Keeping your own mind as free as possible, therefore, from bias, you should make inquiries as to all the leading functions before deciding upon the diagnosis. A good rule to follow, in important cases, is to begin at the head and ask questions likely to elicit information regarding the condition and activities of the various parts in a certain order, beginning with the brain and spinal cord, then inquiring about the upper respiratory tract, lungs, etc., the heart and circulation, the digestive system, and the genito-urinary apparatus.

Systematic Questioning.—Taking these up in order, you should inquire as to the memory and capacity for sustained mental effort; as to the sleep, whether sound and ample, or in any way imperfect, and if so in what way; as to any tendency to headaches, and if so, whether they always follow some special provocation, such as imprudence in eating or drinking,

overfatigue, etc., or recur at intervals, as in migraine, without any apparent exciting cause; further as to backache, numbness or tingling in the extremities, etc.

Next you should inquire as to any history or present existence of catarrh in the upper respiratory passages, cough, asthma, former attacks of influenza, pneumonia, pleurisy, or bronchitis.

Coming to the circulatory system, you should ask whether there is, or has been, palpitation of the heart, pain in the precordia, shortness of breath on exertion, cold extremities, œdema of the feet or ankles, etc.

The digestive system requires particular attention, since derangements here are more common than those of any other functions, and may affect directly or indirectly all the other systems. You should inquire concerning the appetite for each of the three usual meals, whether abnormally great, slight at first but increased somewhat after beginning to eat, or absent, with or without a disgust or loathing for food; any peculiar taste in the mouth mornings; whether there is unusual thirst or lack of it, the number and character of meals taken daily, as well as the hours of the day when they are eaten, how punctually they are taken then, and the time usually spent in eating them—which is often a better way to put the question than to ask bluntly whether the patient eats slowly, with thorough chewing, or fast with incomplete mastication. Another indirect method of learning whether or not there is poor mastication, perhaps the most frequent cause of indigestion, is to inquire whether much fluid is taken with meals, and, if so, whether it is used to help wash down the food or only after the boluses of the latter have been swallowed. It is well, too, that the patient should be asked about the condition of the gums and teeth, and the ability of the latter to do the work required of them.

How to Detect Dietetic Sins.—All methods of finding out a patient's pet dietetic sins will now and then fail, but one of the surest (with the exception of resorting to frequent lavage)

is to get him to jot down regularly what is eaten or drunk at each meal, as well as the tidbits and the extra lunches between meals at teas, receptions, etc.—both the various articles and the amounts of each ingested. There are dyspeptics who, though they have (as the Germans say all persons have) the stomachs they deserve to have, will tell pretty nearly the truth, when obliged to put down the facts thus in black and white. This method is practicable after treatment has been regularly begun, but in recording the history at the outset, you will of course have to depend largely upon the usually rather vague general answers to your questions as to what is commonly eaten. However, by asking specifically, for example, at how many meals meat is eaten each day, the kind and how cooked, as well as what desserts, what beverages,—if alcoholic ones, the kinds and quantities, and if coffee or tea, how much and how strong,—you can generally get some idea as to the prevailing habit or tendencies of the patient regarding diet.

Pain or Discomfort.—You should inquire particularly concerning any discomfort or pain during or after meals, whether in the esophagus, gastric region, or elsewhere in the abdomen. If difficulty in swallowing is complained of, ask as to its exact location and degree of persistency, or if occasional only, the times of recurrence, and whether the food sometimes comes up again (regurgitation) on account of it; also whether liquid readily passes into the stomach even when solids do not. If pain occurs, ask whether before or after eating, and if after, ascertain exactly to what part of the epigastrium it is referred and if felt also in the back, how long after and whether after all meals as a rule, or after large ones only, or after particular kinds of food, or apparently regardless both of the amount and the quality of food or drink taken. Ask especially about the kind of pain or discomfort, whether burning, sharp, stabbing or boring, or whether dull and slight, or merely a sensation of fullness or weight—a bearing-down feeling. If there is no pain, find out if the patient is drowsy after meals.

Nausea and Vomiting. Eructations.—Inquire as to nausea

and vomiting, and if either or both occur, ascertain definitely when and under what circumstances, the same as concerning pain. Ask then whether blood, any reddish substance or altered blood resembling coffee grounds, is ever present, either in the matters vomited or in the stools. Question closely as to the habit of eructation or belching, but as some patients belch unconsciously, ask the same question also of some other member of the family. I once sat next at table to a lady who rarely finished a meal without bringing up more or less noisily a quantity of gas from her stomach, yet later, when, being called upon to prescribe for her, I inquired as to eructations, she replied that she was not troubled in that way. Still, patients are, as a rule, only too painfully aware of the symptom, and eager to have it relieved. When eructations are complained of, learn whether or not the eructated gas has any taste or smell, and if so what kind—also whether belching freely usually relieves any associated gastric pain.

Bowel Movements.—Question with special care about the action of the bowels, whether there are daily normal evacuations or any derangement in the direction of either constipation or diarrhea. It is absurdly insufficient to be satisfied with the answer that the bowels are “regular.” An instance is on record of a woman who made this answer, and later it was found that she had one movement a week, which occurred regularly every Sunday morning before she went to church. Ask as to the number, color, character, and form of the stools passed daily or every other day, whether or not mixed or covered with blood, mucus, or pus; as to the presence in the stools of altered blood, resembling coffee grounds. A further point of diagnostic importance to be elicited in regard to blood accompanying stools is whether it is bright red, showing an arterial origin, or dark red but fresh looking, pointing then to a source low in the bowels and usually signifying hemorrhoids. Inquire further as to any abnormality accompanying defecation, such as discomfort, pain, or straining. If diarrhea be reported, ascertain whether it consists of merely one or two

loose stools in the morning (the so-called morning diarrhea) or whether the loose movements are more frequent, and likely to occur at any time of the day or night. In such cases learn definitely about the color, odor, and character of the stools, whether very thin, like dishwater, gruel-like, soft and mushy, putty-like, or fully formed—sausage-shaped; also if formed, whether of normal size or small and narrow—of finger or lead-pencil size—as in spastic constipation.

Flatulency.—Inquire regarding the presence of gas in the bowels, the times when it most frequently occurs, the odor of it, whether particularly offensive or nearly odorless, the amount of it, whether slight or so great as to maintain an almost constant rumbling and occasional loud explosions, so as to keep the patient out of society. Ascertain further regarding the reaction of the system to the gas formed, that is, whether it passes rapidly through the intestines and out at the anus with or without an accompanying stool, or is long retained in some one or more pouches which are greatly over-distended, with pain and at times violent colic through irregular contractions—cramp pains—or merely sufficient to produce much discomfort by day with insomnia or broken sleep at night.

The Genito-urinary System.—Whatever your suspicions or provisional diagnosis may be, you should neglect none of the chief systems of the body in your interrogation of the patient. The answers may bring out very unexpected symptoms, thus leading you to examine or have examined, and possibly find an important lesion in, a region which would otherwise have been wholly neglected with the result of an incorrect diagnosis. Inquire concerning micturition, its frequency by day or night, and any accompanying pain, discomfort, delay or difficulty; and in the case of men, the character of the stream passed, also as to pain in the region of the bladder or rectum, referable to either hemorrhoids or a diseased prostate gland or trouble in the seminal vesicles. In the case of both men and women, do not fail to ask particularly regarding sexual matters, except

when the patient is an unmarried woman. An enormous amount of disease affecting every one of the other systems has its origin in faulty sexual hygiene, and, delicate as the subject is, the physician who ignores it must very often leave undiscovered the cause and nature of the trouble he is attempting to remedy, with a resulting failure which is harmful always and sometimes disastrous to both his patient's health and his own reputation. Excessive sexual indulgence is doubtless common enough, and the cause of considerable disease; but masturbation, the abnormal excitation of sexual passion without the normal satisfaction of it, incomplete coition, that is, the act interrupted to prevent conception, and other perversions or abuses of the reproductive instinct, are all exceedingly prevalent and result indisputably in a very large amount of ill health. If you will question all married persons as to the number of children they have had, the intervals between pregnancies, and, when these have been exceptionally long, as to any methods practiced for preventing conception, you will be surprised at the number of respectable and otherwise excellent and intelligent married couples who have for years been resorting to the *coitus interruptus*, with a resulting wrecking of the health of one or both, including nearly always the nervous and digestive systems. In the case of women, besides interrogating as to urinary symptoms, you will, of course, inquire concerning pains in the lower back and pelvic region, and very fully as to the menstrual function, whether regular and at what intervals, the amount and character of the blood lost, the duration of the periods, and whether painful or not.

When there is suspicion of masturbation or abnormal sexual excitation in any form you will need to exercise much discretion in each case as to whether it is better to ask questions upon the subject with all possible delicacy, or to convince yourselves by other means such as an examination of the genitals. Masturbation usually produces certain changes in them and can often be recognized also by other signs.

LECTURE V

THE PHYSICAL EXAMINATION OF THE PATIENT

General Considerations.—After a full and systematic interrogation of the patient, you may or may not have ground for suspecting some of the digestive organs to be involved. If the chief complaint has been of indigestion, or of any irregularities or abnormalities connected with the digestive functions, whether it be of a dry mouth, pointing to deficient or defective saliva or, at the other end of the alimentary canal, difficult or painful defecation, it will be desirable to make an examination of the entire digestive system, for deficient saliva impairs the digestion and piles usually result from an overworked liver. The cause of the trouble, even in these cases, however, will often be found elsewhere. It may be a consequence of heart disease, tuberculosis, or a disorder of the nervous system acting reflexly upon the stomach or intestines. After an exploration of the gastro-intestinal organs and testing the stomach, if no abnormality appears to exist in any of them, you will naturally look further for the cause of the malady.

A constant coldness of the hands and feet would indicate derangement of the circulation, but by no means necessarily heart disease. Much oftener it is due to a contraction of the arterioles resulting from an excess in the blood of xanthin bases or other toxic products of a faulty assimilation, and in all such cases some of the digestive processes are imperfectly performed.

But, on the other hand, there may be serious disease in one or more parts of the digestive system even when none of the symptoms seem to point in that direction. For instance,

persistent or frequent insomnia, in the absence of pain anywhere in the body, should awaken suspicion of a digestive derangement, especially of excessive secretion of HCl, sluggish intestinal functions, flatulency, etc., and pain in the lower back in women or other complaints in them dependent upon a displacement of one of the pelvic organs, should lead to a careful search for a downward displacement of the stomach and transverse colon with or without a coincident ptosis of the kidneys and others of the abdominal organs, since these latter displacements very frequently precede the trouble in the pelvis, producing by a direct pressure a malposition of the uterus.

Whenever you have reason to think that some part of the digestive system is at fault, you should proceed to an examination of the organs connected therewith in an orderly and thorough manner, carefully recording the results.

Inspection.—Every examination properly begins with inspection. Naturally you will first look the patient over carefully and note his appearance, the tint of the skin and condition of nutrition generally—*i. e.*, whether he is of full habit and plump with smooth rosy skin and pink cheeks, or, on the contrary, thin, emaciated, wrinkled prematurely, pale or sallow, etc. You could scarcely fail to notice also whether the expression is one of cheerfulness and contentment or whether it shows pain, anxiety, worry, or depression. Dyspeptics are most likely to present the latter aspects, especially if their dyspepsia depends upon an organic lesion or serious functional derangement of long standing, though in some cases of hysteria and in a smaller percentage of cases of neurasthenia with sympathetic disturbance of the digestion, there may for a long time be good general nutrition with a well-rounded form and the bloom of health. A similar robust appearance may coexist with gastric catarrh or round ulcer of the stomach in their earlier stages. As a rule patients who have suffered for several years with decided indigestion whether from organic or so-called functional, reflex, or sympathetic causes, show a lowered nutrition, not possessing either a ruddy complexion

or the usual amount of adipose tissue, but there are many exceptions, especially as to adiposity.

After such a general inspection, you should look carefully into the oral cavity and note very particularly the condition of the lips, tongue, teeth, gums, and pharynx. The tongue may sometimes be clean and natural looking in spite of the fact that a considerable catarrhal process exists in the stomach or intestines, and in general its appearance may depend upon the condition of the pharynx or upon that of any of the structures below. It is probable, too, that catarrh of the duodenum, quite as often as a similar process, in the stomach, is accompanied by a furring of the tongue. Whenever, however, the tongue is coated, there is trouble somewhere requiring attention—either, as is most usual, in the alimentary tract, or else deficient excretion through the kidneys relative to the amount of poisons to be excreted. If it results from a catarrhal inflammation in the pharynx, it is still important, since the latter, when allowed to run on, tends ultimately to involve, both by continuity and by infection through the swallowed mucus, the esophagus, stomach, and intestines.

Without a sufficient number of properly opposed teeth to do good chewing, there cannot be a satisfactory digestion. Decaying teeth and diseased gums are often the unsuspected cause of troublesome inflammatory conditions in the stomach. I have encountered numerous cases of chronic gastritis which yielded promptly after the mouth had been cleared of rotten stumps of teeth, or a purulent process in the gums had been cured. Boas reports cases of gastric catarrh which were treated ineffectually for years, but quickly responded after remedying a chronic inflammation of the pharynx.

The uncovered thorax and abdomen should next be closely inspected, never neglecting the precordial region, since heart disease so generally disorders the digestion, producing a stasis in the liver and viscera with constipation, hemorrhoids, etc. Note whether the apex beat is in its normal site in the fifth interspace inside the nipple line, or further out or lower

down, as in hypertrophy or dilatation, and also whether there is bulging of the chest wall directly over the heart, increase in the width of the intercostal spaces on the left side, or a forward projection of the lower end of the sternum, as may often be seen in marked cardiac enlargements.

Inspection of the abdomen, though inferior to palpation and percussion, is one of the useful methods of examination and often affords valuable information. It should never be neglected when any digestive disorder is suspected. Even without inflating the stomach or colon (procedures the technique and results of which I shall discuss later) much can be learned by a critical survey of the entire region bared of covering. The relaxed, flabby, and pendulous abdomen of the woman who has borne many children, or been formerly very obese, but subsequently lost her flesh through ill health, not through exercise, will contrast markedly with the firm, symmetrically rounded form of the woman, young or old, who, whether she is a nullipara or a multipara, and whether she was at one time obese or not, has kept her trunk muscles in good condition by physical training as well as by the avoidance of tight corsets and of all luxurious enervating habits. If there is not too thick a layer of adipose tissue, and any of the viscera happen to be distended with gas, their outlines may frequently be determined by inspection without the help of palpation or percussion. Inspection may reveal a separation of the recti abdominalis muscles, especially when the patient is obese and the intestines are full of gas. There is often a bulging outward then of the abdominal wall between the separated muscles. If the patient stands up while the abdomen remains exposed to view, any marked existing sagging (ptosis) of the viscera may be recognized. Such a displacement includes often the stomach, colon, and small intestines, with frequently one or both kidneys (the right one especially), and sometimes the liver and spleen may be recognized by the prominent bulging which would then show below the umbilicus (splanchnoptosis). Skilled palpation in such cases will generally demonstrate the right kidney

(and sometimes both kidneys) to be movable. Exceptionally the liver and spleen will also be found to be displaced downward, but it is rare that any one of these ptoses occurring by itself, except those of the stomach and intestines, is visible. A far advanced tumor of one of the viscera may also, sometimes, be manifest at a glance. In thin persons peristaltic movements may often be observed over the stomach and intestines, particularly when the motor function has been in some way disturbed.

Note particularly the appearance of the abdominal veins, whether or not swollen and tortuous and the amount of such swelling and tortuosity. The latter condition is significant of an obstruction to the return of the portal blood from the abdominal structures, and indicates frequently cirrhosis of the liver, though pressure from tumors may sometimes produce the same condition. The presence of fluid in the peritoneal cavity (ascites), when in large amount, may be detected by inspection, the whole abdomen being symmetrically enlarged, especially in its lower part when the patient stands, and in the flanks more particularly, when he is lying on the back, although when the accumulation is extremely large, the abdominal walls may be so fully distended that there is little change in their appearance in the two different positions. The bulging below the line of the umbilicus, in cases of general sagging of the viscera (splanchnoptosis), differs from the swelling in a case of moderate ascites chiefly in that the bulging in the former is more central and does not change so greatly upon the recumbent position being assumed.

Palpation.—Palpation is one of the most important methods of examination and is a difficult one in which to become expert. Good training and much experience are both necessary to fit the clinician for accomplishing accurate results by means of it, but the art, once acquired, is of the greatest value, especially in the exploration of the abdominal viscera. For palpation in this region, place the patient in a recumbent position with the knees flexed over a pillow. To palpate well you will need to

keep your fingers soft and smooth on their palmar surfaces and be sure that they are warm; for nothing is so likely to provoke embarrassing resistance through involuntary contractions of the muscles overlying the parts being explored as coldness of the palpating fingers. Feel very gently first over the surface with the flat of one hand constantly in contact with the abdomen, employing at first the lightest touch, and then afterward, when the parts have become more accustomed to the manipulations, gradually insinuate the tips of your fingers deeply down into the cavity, until finally you may often be able with one hand superimposed over the other, to bring them into contact successively with the various structures upon the back wall of the abdomen. This should enable you to recognize marked abnormalities of these structures, including the appendix vermiformis, as to size, position, and degree of hardness, also to determine the existence, situation, and size of tumors in the abdominal cavity. Note any unusual resistance, but be very careful not to be misled by contractions in the recti muscles.

Indeed, the condition of the abdominal muscles generally, as to their relative tonicity and reflex excitability, varies greatly in different patients, as well as in the same patient at different times. This has important bearings upon the diagnosis and treatment. In persons of normal nerve tone it should be possible by diverting their attention, as by conversation during gentle palpation, to obtain sufficient muscular relaxation for very satisfactory results. One may then feel through even the well-developed recti muscles and determine the condition of structures beneath them. When there is marked flabbiness of all the muscles, as in many persons with ptoses, without unduly heightened reflexes, palpation is unusually easy and fruitful in results. On the other hand, various degrees of increased reflex excitability will be found in the abdominal muscles of patients, and in some this is so extreme that upon the first attempts at palpation the muscles instantly stiffen, becoming board-like in their rigidity. In

these cases palpation reveals almost nothing except the bare fact that there is a peculiarly excitable nervous and muscular system, from which you may generally infer the existence of neurasthenia with probably also spastic constipation, and very commonly, though not necessarily, excessive secretion of HCl in the stomach. But even in these cases you may often succeed after the patient's nervousness has been calmed. By gentle friction with well-warmed hands over the abdomen and patiently persisting, it is frequently possible to make finally a fairly satisfactory palpation, even when at first the slightest pressure of the finger tips was opposed by a vigorous muscular contraction.

To map out and explore by palpation the less deeply placed organs of the abdominal cavity the left hand should be used to push the organ toward the palpating hand and hold it in position, while the fingers of the latter are made to pass lightly over and around it. By a form of this bimanual palpation either kidney can be very easily felt, when sufficiently movable to appear even in part below the ribs. To examine the right kidney, the examiner sits on the right side of the patient. His left hand is pressed against the site of the kidney from behind while his right hand is pushed, gently but deeply, down into the abdominal cavity from in front just to the right of the median line and directly under the level of the lowest rib, the fingers of this hand being directed downward and outward. Then, if the kidney be not loose, the fingers of the two hands will meet with nothing but the anterior and posterior walls of the trunk between them. But if the kidney is movable it may be recognized and grasped as it emerges from behind the ribs during a full inspiration, and, returning, can again be felt to pass through the fingers with expiration. The pressure should be light during inspiration so as to let the kidney descend, but strong at the end of inspiration to retard the kidney's return. To examine the left kidney the physician should be on the left side of the couch or examining table, and the positions of the hands are reversed. A movable or prolapsed kid-

ney is often very sensitive and should not be roughly handled.

For a fuller account of the method of palpating the kidneys with an illustration of the method, see Lecture XL., on Movable Kidneys.

The position and size of the stomach and its pyloric end can sometimes be made out by palpation alone, and it must be our main dependence for the determination of the thickness of the walls of these structures. The same is true as to the colon, especially its transverse portion, which is often palpable. Fecal concretions and accumulations may usually be felt in patients who are not too stout. Downward displacements of the liver and spleen (which, however, occur only exceptionally, while the right kidney, in women particularly, is very frequently thus displaced) may be recognized by palpation as well as by percussion. Unusual mobility of the tenth rib through a lack of its proper attachment to the rib above will be found at times in neurasthenic persons, and is considered by Stiller a valuable sign of what he holds to be a congenital tendency to neurasthenia and relaxed muscles generally.¹

Supplementing palpation by pressure with the finger-tips assists in making the diagnosis of various abdominal diseases. When such pressure causes acute pain over small circumscribed areas it must always awaken the suspicion of ulcer; or it may signify appendicitis when the tender spot is over McBurney's point in the cecal region. If the sensitive area is in the epigastric region, especially just below the ensiform process of the sternum, or if it is over or to the left of the tenth, eleventh, or twelfth thoracic vertebra, the ulcer, if present, would usually be in the stomach; if a little to the right of the median line in front, and somewhat lower down, it would be more likely to indicate duodenal ulcer in any case presenting other symptoms of ulcer in that locality, including the passage of stools containing altered blood. An acutely sensitive spot over the

¹ *Arch. f. Verdauungskrankh.*, vol. vii. p. 375.

cecum, especially if near McBurney's point, might signify either ulcer or appendicitis, though it might mean merely catarrh of the cecum. In the case of even chronic catarrhal appendicitis a swelling can usually be made out by the skilled diagnostician in a patient who is not very stout.

A lesser degree of sensitiveness to pressure, particularly if more diffused, would suggest the possibility of a chronic catarrhal inflammation of the viscus underneath, though it might be due to a hyperæsthetic condition of one of the plexuses of the sympathetic, or indicate nothing more serious than a highly-wrought and oversensitive nervous system. But in the latter case you would generally find a similar hyperæsthesia over most parts of the abdomen and possibly even over the thorax or arms.

Palpation over the spinal vertebræ and over the regions on either side of the vertebræ, where the spinal nerves emerge from the intervertebral foramina, is also highly important in many cases. All authorities upon diseases of the stomach recognize the importance of palpation over the lower dorsal spine in suspected gastric ulcer. When ulcer is present in the stomach there are nearly always spots painful to pressure, either over or more frequently to the left of one or more of the vertebræ between the eighth dorsal and the first lumbar. In my experience these spots are oftenest found just to the left of the eleventh or twelfth dorsal vertebræ.

It does not, however, seem to be generally recognized that chronic disease in any part of the gastro-intestinal tract is likely to be accompanied by sensitiveness to pressure over or along the side of the spinal vertebræ corresponding to the points of emergence of the spinal nerves which contain fibers supplying the viscera involved. The late Dr. Hammond, in his work on "Diseases of the Nervous System," devoted much space to an account of the nerve affection known in that day as spinal irritation, and in the course of that account called attention to the fact that, when any portion of the spine is sensitive to pressure, the viscera supplied by nerves passing out from the

spine in the same region are often found to present abnormal conditions.

He quoted from numerous authors views similar to his own, and all seem to have considered the coincident visceral disturbances as results rather than causes of the spinal condition. Dr. Hammond¹ quoted one writer as follows:

“Mr. J. R. Player was among the first English physicians, if not the very first, to call attention to the fact that eccentric derangement of function may be the result of irritation of the spinal cord. Thus he says: ‘Most medical practitioners who have attended to the subject of spinal disease must have observed that its symptoms frequently resemble various and dissimilar maladies, and that commonly the function of every organ is impaired whose nerves originate near the seat of disorder. The occurrence of pain in distant parts forcibly attracted my attention, and induced frequent examination of the spinal column; and after some years’ attention I considered myself enabled to state that in a great number of diseases morbid symptoms may be discovered about the origins of the nerves which proceed to the affected parts, or of those spinal branches which unite them; and that, if the spine be examined, more or less pain will commonly be felt by the patient on the application of pressure about or between those vertebræ from which such nerves emerge.’”

Dr. Hammond himself gave the following directions for carrying out an examination of the spine:

“To ascertain whether or not the tissues outside of the spinal canal are in a state of hyperæsthesia, the pressure should be applied with gradually increasing force, by means of the thumbs applied to the spinous processes and the intervertebral spaces, as recommended by Flint. The examination should be thorough and extend throughout the whole extent of the vertebral column. The fact that the patient denies the existence of tenderness should have no weight with the physi-

¹“Diseases of the Nervous System,” by Wm. A. Hammond, M. D., New York, 1876, p. 387.

cian. Only a few days ago a young lady consulted me for severe infra-mammary pain, headache, and nausea. I at once suspected spinal irritation, but she declared, in answer to my inquiries, that there was no sign of tenderness anywhere over the spinal column. I insisted, however, on a manual examination, and to her great surprise found three spots that were exceedingly painful to slight pressure. This young lady had been treated for dyspepsia for several years, without deriving any benefit from the measures used, but was cured by the treatment which I shall presently fully consider. Occasionally it happens that the tenderness is not perceived for some time after the pressure is made. In a recent case I found the interval to be over a minute, and then acute pain, following the course of the nerves, was experienced. I am not prepared to offer an explanation of this phenomenon."

Dr. John P. Arnold has recently called attention to a novel objective sign which may be recognized upon palpation over the sensitive regions alongside the spinal vertebræ, and sometimes in such regions which are not sensitive to pressure, though in all cases he maintains that the part of the body supplied by the vaso-motor nerve fibers emerging in the corresponding intervertebral space will be found to present some abnormal condition. The peculiarity described by him is, in such cases, a somewhat doughy, and in chronic ones, a gristly, tense, cord-like feeling of the band of longitudinal muscular fibers which run up and down on either side of the spine. This abnormality is supposed by Arnold to be due to a congested or infiltrated condition of the muscle while the cord itself is anæmic, probably, in chronic cases. Hammond believed the spinal cord to be anæmic in such cases. The findings obtained by a careful palpation over the spine should thus assist in directing our attention to the organ or part of the body which may be suspected of being diseased.

You should make it a rule to examine carefully the spines of all chronic invalids by pressing deeply with the finger-tips (or with the thumbs, as Flint advised) close to the vertebræ

and then exert gentle traction in a lateral direction outward from the spine on either side. The patient should be lying upon his right side while you palpate along the left side of the vertebræ, and should then change to his left side in order that you may palpate upon the right side of the latter, so that the tissues may be in the utmost condition of relaxation practicable. In both cases you will find it best to stand in front of the patient and reach over his upper side to make palpation along the region of the upper side of the spinal column.

In numerous patients, especially those suffering from digestive derangements, you will be likely, while palpating in the way described, to recognize in the longitudinal muscles running parallel and close to the spine the tense, cord-like sensation above mentioned. If, simultaneously with your recognition of such a condition, the patient complains of sensitiveness in the same regions, the accuracy of your finding will be at once confirmed.

By noting in Lecture II. concerning the anatomy and physiology of the nerve supply of the stomach and intestines to what part of the tract the vaso-motor nerves are supplied which emerge from that segment of the spine near which the tenderness and signs above described can be made out, you will be enabled to direct your suspicions to the organ or part thus supplied. For example, if you can find this sign by palpating alongside of any of the lower dorsal vertebræ, and, especially if there is sensitiveness also to pressure in the same place, you should suspect some disease in the stomach, or possibly in the small intestines; but it might signify disease in the liver or pancreas, either alone or in conjunction with an involvement of the stomach and small intestines, since the vaso-constrictors which supply all of these organs are found in some of the spinal nerves, from the fifth dorsal to the second lumbar.

AUSCULTATION AND PERCUSSION

Auscultation plays a comparatively small part in the examination of the abdominal organs, yet it can be made to afford information of value. When one drinks, a swallowing sound may often be heard over the ensiform process and normally about seven seconds later a second sound caused by the passage of the liquid into the stomach. But in cancerous or other obstruction of the cardiac orifice of the stomach, as well as in the case of obstruction of the esophagus from any cause, there is usually a delay in the passage of food or drink into the viscus, and auscultation with a stethoscope of the second swallowing sound generally shows then a prolongation by eight to ten seconds of the ordinary time required for this sound to be audible after the subject has swallowed. When the obstruction is marked, the swallowing sounds may not be heard at all. But this sign is not very reliable. The first sound is very often not audible in health, and the second swallowing sound may exceptionally be delayed in health, and instances are on record of its having been heard at the normal time when cancer of the cardia was present, though probably in an early stage.

Auscultation of percussion and friction sounds (called auscultatory percussion and auscultatory friction) afford a very delicate method of determining boundaries, as will be described in Lecture VI. under the head of Summary of Author's Method.

Percussion is the most convenient and generally serviceable of all the methods of determining the size and position of the abdominal organs, and when with this are conjoined inspection and palpation, as well as auscultation of the splashing sound elicited by light tapping with the finger tips (*clapotement*), sufficiently exact results are as a rule obtainable for all clinical purposes. A more particular description of percussion appears in Lecture VI., under the title of "The Author's Method of Outlining the Stomach," etc.

Instruments for Determining the Size and Position of the Viscera.—Numerous ingenious forms of apparatus have been

devised with the idea of accomplishing these results more accurately. Einhorn's gastroduiaphane, one of the best of these, consists of a small electric lamp placed at the extremity of what is virtually a stomach tube, through which pass rheophores connecting the lamp with a battery outside. After the patient, with bared abdomen, has drunk one or two glasses of water the instrument is introduced into the stomach, the room having first been darkened, and the current is turned on.

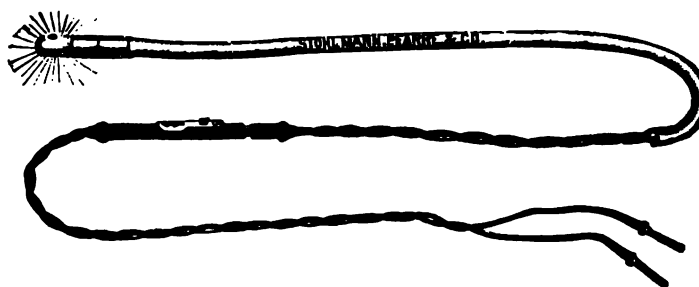


FIG. 14.—Einhorn's gastroduiaphane.

When the abdominal wall is not too thick, a glow of light can then usually be seen over and for two or three inches around the situation of the lamp. By having the patient assume different positions, the lamp can generally be caused to fall to the lowest part of the stomach and move from side to side, so as to show approximately the lower boundary of the stomach. Certain authors maintain that while this is, on the whole, a satisfactory means of mapping out the stomach, it is liable to mislead by the glow of light appearing most conspicuously some inches above, below, or to one side of the actual site of the lamp. It is a pretty method for class demonstration, and is very convincing to the friends of patients who might otherwise be skeptical as to the accuracy of a diagnosis of enlargement or displacement of the stomach. The gastroduiaphane has proved of value according to my experience, especially as an aid in determining whether a tumor felt in the region of the stomach is in the anterior or posterior wall. When it is

in the former, and the lamp can be placed behind it, there appears a shadow in the patch of transmitted light. (See Figure No. 14.)

Turck of Chicago some ten years ago invented a revolving sound with a piece of sponge fastened to its distal extremity, for the purpose of cleansing effectually the walls of the stomach in cases of stubborn gastric catarrh, in which the secretions are often very viscid and adherent. This, by means of a simple crank mechanism attached to the upper end of the sound, is made to revolve and in doing so is moved from one end of the stomach to the other, following first the greater and then the lesser curvature. The inventor observed that the instrument, as it wobbled its way around inside the organ,



FIG. 15.—Turck's gyromele.

could be very plainly palpated from the outside by the examiner while an assistant turned the crank. In this manner the instrument, which Turck named the gyromele, affords probably the most exact and reliable information obtainable with regard to the boundaries of the stomach. (See illustration.)

In my earlier examinations of gastric cases I made use of the gyromele frequently, but with increasing experience in the employment of the convenient and altogether satisfactory methods described hereinafter, I now rarely find myself in need of any intragastric instrument to determine with an all-sufficient exactness the position and size of the stomach.

Both the electrodiaphane and the gyromele have been used

to assist in determining the position and size of various portions of the colon. With a reasonable amount of skill in the manipulation of them, they may prove very useful for these purposes, even though not often indispensable. By inflating the colon with air after emptying it thoroughly of feces, its position and the size of its different parts can usually be made out with sufficient accuracy, when the stomach has previously been filled with fluid. However, in doubtful cases in which extreme precision in diagnosis is important, and especially when there is reason to suspect very anomalous displacements, you should



FIG. 16.—Electric gastroscope.

know how to avail yourselves of the confirmatory results obtainable by these very ingenious instruments.

A great variety of instruments has been designed for the inspection of the rectum and sigmoid flexure. Illustrations of some of the more useful ones are given in the lecture devoted to Diseases of the Rectum and Anus. For the examination of the colon generally the x-rays can be employed after previously injecting one or two quarts of warm water containing in suspension subnitrate of bismuth, about one ounce to the quart. By means of the x-rays the conditions existing in the lower colon, as to position, etc., can be very clearly made out when

a soft rubber rectal tube, having a flexible cable inside of it, has been previously introduced.

Various other instruments have been invented and are sometimes employed by gastrologists in the examination of the stomach and other viscera and for testing their motor power, but most of these are not indispensable. The gastroscope, a metal tube devised with the idea of affording a view of the inside of the stomach, is not safe for general use, and even specialists rarely introduce it. It gives very little information of value, and cannot be introduced even by the most expert without causing the patient much pain and involving the risk of doing serious harm if there should chance to be present a latent ulcer in either the esophagus or stomach. An illustration of an improved electric gastroscope is herewith shown.

Needless instrumentation, like needless surgery, it seems scarcely necessary to say, should be avoided, and I here describe and recommend the simplest methods which will effect the object in view. The soft, flexible tube is indispensable in many cases for testing the gastric contents as well as for lavage, and patients soon learn to tolerate this when deftly used, but they are not always so easily reconciled to more formidable intragastric apparatus.

LECTURE VI

THE AUTHOR'S METHOD OF OUTLINING THE STOMACH AND DETERMINING THE STATE OF ITS MOTOR FUNCTION— OTHER METHODS OF EXAMINING THE VISCERA

THE subjoined extracts from a paper written by myself¹ while engaged at work in Professor Ewald's clinic in the Augusta Hospital in Berlin, during the year 1895, explain further the reasons for seeking to acquire exact knowledge concerning the stomach and its functions by the simplest and least disturbing methods, and also describe the combination of such methods which I have found entirely satisfactory. Nine years more of experience with the same methods have confirmed the opinions then expressed. With the exception of the soft rubber tube required to perform lavage in cases of stubborn gastric catarrh or dilatation and to extract the gastric contents for the purpose of analysis, I do not advise physicians in general practice as a rule to employ instruments within the stomach. Those of you, however, who have not acquired sufficient expertness in percussion and its various modifications may find an advantage in other methods, and in the cases of patients who present none of the symptoms of ulcer or cancer and swallow the soft tube without difficulty, may safely venture upon introducing either the gastroduaphane or gyromele to clear up a doubtful diagnosis. Under similar conditions and restrictions only do I advise you to use for the treatment of obstinate cases of gastralgia, deficient gastric motility, or hydrochloric-acid excess, the method of intragas-

¹ *Med. News*, January 18, 1898, and *Berliner klin. Wochenschr.*, 1896, No. 7.

tric electricalization for which special electrodes have been devised by Stockton, Ewald, Einhorn, myself, and others. With the same qualification, you may also find it safe and helpful at times to employ an intragastric spray apparatus. But this will be discussed under the head of treatment later on. Here follow the extracts from the paper above referred to:

The Use of a Stomach Tube Sometimes Impracticable.—

“There are many cases of gastric disease in which, for one reason or another, we cannot employ even the soft tube, and still less the sound, or any of its ingenious modifications and amplifications.

“Besides the contra-indications, we are obliged to take into account the foolish dread which many nervous patients have of this trifling procedure (the introduction of the stomach tube) amounting sometimes to an insuperable obstacle.

“In order to reach as accurate a diagnosis as possible in such cases, I have been obliged to make the most of the various methods which do not include the employment of any instrument inside the stomach. Trusting that the mode of systematizing such methods which have proved useful in my own work may be helpful to others, I venture to submit a description of it. . .”

A Combination of External Methods.—“We pass on to a study of clapotement (eliciting a splashing sound by tapping with the fingers) and percussion. It is to the value of the combined employment of these two procedures, according to a certain order, that I desire to call attention especially. Both are separately well described in the works of Ewald,¹ Boas,² and other standard treatises on diseases of the stomach, and during recent years there have been numerous contributions to current medical literature on abdominal percussion. The most notable of these is a paper by Dehio,³

¹“Diseases of the Stomach,” by Prof. C. A. Ewald, M. D., New York, 1893.

²“Diagnostik u. Ther. der Magenkrankheiten,” by Dr. E. Boas, 1894.”

³“Zur physikalischen Diagnostik der mechanischen Insufficienz des Magens,” by Dr. Dehio. Separat Abdruck aus den Verhandlungen des Congresses f. Innere Medicin.

in which he gives directions for percussing with the patient lying on the back, as well as standing, after drinking various portions of water. He states that the normal empty stomach is entirely within the thorax, and not accessible to percussion, but that the drinking of one-quarter of a liter of water produces in the erect position a dull area, which extends $11\frac{1}{2}$ cm. below the lower end of the corpus sterni; then by drinking the same quantity a second time, the dullness is extended 2.7 cm. further downward, and so on, until, after the person has taken a whole liter, he finds in the majority of cases the lower border of stomach dullness a few centimeters above the level of the umbilicus. He points out also that from the different degrees of distensibility thus indicated we may infer much as to the motility of the stomach.

"On the other hand, Jaschtschenko,¹ at about the same time, took quite the opposite view of the matter. He sharply criticises Traube, whose conclusions were similar to those of Dehio above cited, and declares that the empty stomach is percussible, and that filling it gradually with water causes an extension of the dullness upward, but not downward. Neither of these two writers makes any mention of clapotement.

"Obrastrow,² of Kiel, writing on this subject in 1888 an elaborate and valuable paper which I had not seen till the present article had been nearly finished, gave a full exposition of clapotement, but had not at that time as much faith in the accuracy of the information to be obtained by a delicate percussion as he has evidently since acquired, judging by an able contribution which has just appeared from his pen.³

"Certain it is that even the normally small healthy stomach under usual conditions, when empty as well as full, pre-

¹"Die Grenzen des Magens und des Darmcanals," by Dr. P. Jaschtschenko, *St. Petersburger med. Woch.*, 1888, No. 29.

²"Zur phys. Untersuchung des Magens und Darms," von Dr. Obrastrow, *Deutsches Archiv. f. klinische Medicin*, December 7, 1888.

³"Ueber die phys. Untersuchung des Darms," von Dr. Obrastrow, *Archiv. f. Verdauungs Krankheiten*, 1895, B. i., Heft 3.

sents a portion of its anterior surface in contact with the front wall of the thorax, and to a small extent with the front wall of the abdomen below the ribs; and except in conditions of marked obesity it is not generally very difficult to determine both the upper and lower borders of that portion in contact. But stomachs which are thus almost entirely covered by the ribs are rare, at least in civilized communities, and physicians are seldom called upon to prescribe for them.

“Physicians are most interested in abnormal stomachs, which nearly always extend far enough below the ribs to afford us the opportunity of testing their condition by all the usual methods of physical exploration.

“My own experience has convinced me that stomachs, like noses, may vary considerably in size and yet be within normal limits, but that when they extend in the empty condition much lower than a point midway between the sternum and umbilicus, they are generally pathologic. That experience includes the examination of about 300 persons by the methods now under consideration; 225 of these were examined in the course of my practice in Atlantic City, and the remainder in the Polyclinic of the Augusta Hospital in Berlin during the present winter, through the courtesy of Professor Ewald and his chief assistant, Dr. L. Kuttner. By the kindness also of Dr. Oesterreicher, pathologist at the same hospital, I have been permitted to witness numerous autopsies in the cases of persons who had had various forms of gastric disease, as well as a few whose stomachs were normal as to their size and position.”

Experiments Carried Out by the Author in Ewald's Clinic.—“In a number of the cases in Ewald's clinic, in which by external examination I had diagnosticated and designated by chalk lines on the abdomen gross departures from the normal in the way of displacements, dilatation, or both, the stomach was afterward inflated with air and in some instances illuminated by the electric lamp from within, with a substantial verification of the results previously obtained.

"Experiments were made by me in a series of six cases of gastrectasis in Ewald's clinic with a view of ascertaining whether by clapotement and percussion together it is possible to determine positively when the stomach has emptied itself. The patients reported in the morning, fasting. In each of these cases when the splash was obtainable and percussion in the



FIG. 17.—Outlines of gastric tympany on percussion in a case of displacement and dilatation of the stomach.

erect position demonstrated dullness in the lower segment of the stomach, I was able afterward by means of the tube to bring up a considerable quantity of the undigested remnants of a previous meal. Then after carefully emptying the stomach by aspiration the former tests were again employed, and this time with negative results.

"In a number of other (doubtful) cases that were required to present themselves in the morning fasting, the presence of fluid in the stomach was suspected, and to determine the question I practiced clapotement and percussion, but failed to

obtain a splash or to detect dullness over the lower part of the gastric area in the erect position. The tube was then used, but nothing obtained except three or four grams of a pale, thin solution, consisting mostly of saliva.

“ In this simple manner, therefore, we may test the motility of any given stomach frequently, at various intervals after various kinds of meals, with very little difficulty or inconvenience to the patient, especially after the boundaries have once been accurately determined.

“ Numerous experiments have also been made by me to determine whether the stomach fills upwards or sinks lower after the taking of food or drink in successive portions. The results have been somewhat various, as might be expected, according to the muscular energy of the stomach tested. In the cases of gastrectasis and all cases of weak motility, there has been a depression of the lower border after each glass of water except when it was already at the lowest point attainable, and then there was a demonstrable widening of the organ on either side. Since beginning this particular investigation, I have, unfortunately, not been able to find many normal stomachs, but the few presumably healthy ones examined filled upward, without the lower border as a rule showing any noticeable depression after drinking several successive glasses of water, thus confirming the observation of Jaschtschenko rather than those of Dehio and Traube. In some cases, however, in which there were no other signs of weakness, the area of dullness increased both upward and downward after drinking.

“ It is best to examine the patient at a time when the stomach should be entirely empty—that is, in the morning fasting, or six hours at least after the last meal. But this is not always practicable, and after a light breakfast or a very moderate luncheon a healthy stomach will usually be found by the tests of clapotement and percussion to have voided its contents into the intestines at the end of two hours. Even when these tests show that gastric digestion is still incomplete we may in many

cases, nevertheless, satisfy ourselves with sufficient accuracy as to the size, position, and motility of the organ; but in cases of difficulty or obscurity it is safest to examine the second time under the best possible conditions.

"If upon examining a patient six hours at least after his last meal we obtain the splash by clapotement, we can infer deficient motility. Noting at the same time the lowest point where the splash can be distinctly heard, we may infer, as a rule, that the lower boundary extends at least to about that level.

"We should then percuss the abdomen with the patient in various positions to verify the results of clapotement and map out the boundaries.

"If no splash should be obtained, before proceeding to administer water it is well to percuss with the patient first recumbent, and afterward, in the erect position, to determine the apparent stomach boundaries while the viscus is still empty. Note these mentally or mark them on the body.

"Then have the patient drink one-eighth to one-quarter liter of water, and try again to obtain the splash. If it is obtained distinctly after the smaller amount of water mentioned, it raises a question as to the motility, and will also show where to percuss with especial care and delicacy for the lower border.

"For the adept in percussion the fingers may suffice to bring out the finer differences in tone, but with a good percussor and pleximeter the task is greatly simplified."

A New Pleximeter.—"The cut of a new pleximeter devised by myself will be found below. It is wholly made of rubber of medium hardness and is very easily carried in the pocket. The smaller end serves ordinarily as the handle, but in mapping out spaces very accurately or in percussing in narrow spaces, as between the ribs or over the clavicle, especially in children, it is better to reverse the ends and percuss over the smaller part. (See Figure No. 18.)

"Any one of the rubber-tipped percussors usually found in

the instrument-stores can be used satisfactorily with this pleximeter."

Mapping out the Boundary.—"Having already made out the apparent boundaries with the stomach empty, we percuss again with it partly filled while the patient stands, or, in the case of persons who are in bed or very weak, sitting upright

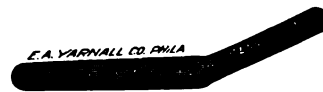


FIG. 18.—Reed's Pleximeter.

will usually suffice to bring the fluid contents in contact with the front wall of the abdomen and thus develop a zone of dullness. In going over a new case in this way it is best to give one glass of water at a time, when, if the stomach is atonic, the area of dullness usually extends downward with each successive glass; but if entirely strong, it extends upward only or mainly.

"One can begin either above or below, and should then percuss carefully in the median, left parasternal, and mammillary lines from the level of the nipple to the pubes in any doubtful case. Having determined the highest and lowest points of the anterior thoracic and abdominal surface with which the stomach is in contact, we should percuss perpendicularly across the oblique curved line joining these points and forming the left lateral boundary of this epigastric area. Then the right lateral boundary separating the stomach from the ascending colon should be made out in like manner. With the patient erect and the stomach well filled, this is usually a simple matter, the ascending and descending colons and their flexures nearly always emitting a more or less tympanitic note, even when partly filled. If the precaution has been taken to have the colon previously emptied, the contrast with the dull note over the full stomach will be, of course, still more marked.

Having the patient lie first on one side and then on the other during the percussion may help to clear up a doubtful question. Filling the colon with air by the double-bulb rubber syringe in the usual manner will emphasize strongly the contrast with the dull stomach-area in the erect position, and filling the colon with tepid water while the patient is recumbent reverses the contrast in a very striking manner, though this is not a feasible undertaking with all patients, since some cannot retain the liquid long enough.

“ The determination of the upper border or stomach-lung boundary is the most difficult part of the procedure. Usually, however, by trying alternately light and strong percussion, there will be obtained a marked difference in the two qualities of the resonant tone, that over the stomach being more tympanitic. Still it requires much skill to make this out quickly and positively. Occasionally, in exceptional cases where the stomach contains very little gas, we may fail at one examination and succeed readily at a second one. This line is sometimes more easily determined after a meal, since then such gases as are present are forced to the upper part and produce more tympany. One needs to bear in mind such possible disturbing factors as a greatly enlarged spleen or enlarged left lobe of the liver; also left-sided pleurisy filling up the half-moon-shaped space of Traube with exudation.

“ However, there is only one condition at all frequent which is likely to prevent us entirely from determining the boundaries of the stomach by the combination of procedures we have been describing, and that is extreme obesity with great thickening of the anterior abdominal wall. Fortunately, however, this is a condition which does not often coexist with any serious form of gastric disease.”

The Determination of the Gastric Motor-Power.—The above-described combination of external methods will enable you to map out the boundaries of the viscera in nearly all cases without even introducing a tube into the stomach, and having done this, to ascertain at any time when the stomach is

empty or contains a large or small amount of fluid. It is then manifestly going only a step further to determine the relative motor power of the latter organ. The presence, extent, and loudness of a splash afford valuable evidence as to the motility, for in a normal stomach there is no splash, and the weaker the walls the greater the splash, but with the data above mentioned you can determine the motor power as absolutely as by the Leube method of extracting the contents with the tube at various times after a definite kind of meal. For, knowing where the lower boundary of the stomach is, with this knowledge, and the aid of percussion and the splash, you can decide with as much exactness as with the tube when the viscus has emptied itself.

INFLATION OF STOMACH AND COLON, ETC.

The principal addition to the above-described combination of examination methods as practiced by me, up to about eight years ago, is preliminary inflation of the stomach with either air forced in through a tube, or carbonic acid gas (CO_2) formed within the viscus by sodium bicarbonate and an acid. Formerly I inflated by pumping in air, and as this required an extra introduction of the tube and was not often absolutely necessary to a satisfactory determination of the boundaries, I frequently dispensed with it. But finding long ago that inflation with CO_2 , when properly managed, involved no danger or inconvenience (notwithstanding certain publications to the contrary), and that it was of very decided assistance in facilitating the process of mapping out the boundaries, I have since employed it in nearly all my important cases after first roughly determining the upper and lower limits without it. The patient is asked to drink a solution of half to three-quarters of a teaspoonful of sodium bicarbonate in a goblet of warm water, or when there is reason to think the stomach is extraordinarily large, a full teaspoonful or even more of the soda is dissolved. Then from 8 to 12 drops of strong chemically pure hydrochloric acid, according to the amount of soda used, is dis-

solved in a glass of water which the patient drinks.¹ After a momentary kneading of the abdomen the two chemicals combine and the stomach is inflated with the disengaged CO_2 , so that a markedly tympanitic note is produced by even very light percussion anywhere over it. This procedure is likely to distend atonic stomachs, increasing their apparent size, and it is therefore, desirable to percuss and try to elicit the splash both before and after inflation.

It will be noticed that I do not follow the directions laid down by most other authors as to the choice of an acid to form with soda the CO_2 . These recommend tartaric acid, which is effective and convenient, but it produces a laxative salt and this is often not desirable. HCl combined in the same way forms sodium chloride (common salt) which is less of a disturbing drug, and I therefore prefer it. Inflation has been produced by me in this way thousands of times without any untoward results and it can, therefore, be unhesitatingly recommended.

Summary of the Author's Method.—Percuss and try to obtain the splashing sound with the patient first recumbent and then in the erect posture; also before and after administering successive glasses of water.

If a splashing sound can be obtained, the lowest point where it can be heard will indicate approximately the position of the greater curvature. When there is doubt or difficulty in distinguishing the percussion notes obtained over it and the adjoining structures, inflate the stomach and then percuss again.

Very delicate and precise results can be obtained by auscultatory friction, with the help of a good phonendoscope or bin-aural stethoscope. In auscultatory percussion, the ear pieces of the instrument being in their places, the other end is held by an assistant or by the patient in the desired locations, while

¹ The amounts of soda here advised are much larger than those necessary to neutralize the specified quantities of HCl (which would be 1 gram HCl to .86 grams HNaCO_3), but there is usually some acid in the stomach, and in any case an excess of soda is safe.

the examiner percusses lightly in various directions from it. The differences in pitch and quality of sound are thus greatly exaggerated.

In auscultatory friction the instrument is held in like manner while the finger tip, pencil, or other similar object is rubbed over the skin. The sound thus produced is heard distinctly so long as the rubbing is made over the hollow organ over which the stethoscope is placed and not more than two or three inches away from it, while upon crossing the boundary to another organ, even an inch away from the stethoscope, it is no longer heard.

Compare the findings from these various percussions under the following different conditions:

I. The stomach and transverse colon being both empty except gas, with the patient recumbent, tympanitic notes, nearly always different in pitch and quality, will be heard over these two viscera, while occasionally a still higher pitched sound may be heard lower down over the coils of the small intestine. The boundary above, between stomach and heart, can then be generally made out except in fleshy persons (who are not often sufferers from serious gastric disease), or when there is very little gas in the stomach. In these cases inflation will be necessary, and this will also greatly intensify the difference between the percussion notes over the stomach and colon.

II. With the same conditions except that the patient is standing the results should be much the same, though since the gas rises to the highest part of the stomach, there is often a greater tympany there. This facilitates the determination of the boundary between the stomach and heart and between the stomach and lungs. If there should be even a very moderate amount of fluid remaining in the stomach, it will give a narrow zone of dullness at its lowest part.

III. With the colon empty and the stomach containing two glasses of water, you will have the same findings as before while the patient is recumbent, except that the tympany over

the stomach should be more marked even without inflation, but upon the standing position being assumed, the condition is immediately and strikingly changed. There is now a decided zone of dullness across the lower portion of the region over the stomach, while the note over the intestines remains tympanitic, as before.

After finishing percussion further useful information may be gained by trying clapotement again with the two glasses of water in the stomach. While the patient is lying on the back, as before described, make repeated tapplings with the fingers over different parts of the epigastric region. If a loud splash is easily obtained over a wide area, the stomach walls are atonic—its motility bad. If, in addition to much splashing in it, the organ has been found to be enlarged, there is gastric dilatation, which is more or less extensive according to the position of the lowest level at which the splash can be produced. The use of the phonendoscope will enable you the more readily to determine this level, though you may sometimes be misled by it, since a splashing sound may often be heard through it at some little distance from the place where it is actually produced. Clapotement is less reliable than percussion for the determination of boundaries, but the two methods may both be employed when accuracy is desired, so as to have one confirm or correct the other.

Radiographs of the Viscera.—As already explained, it is not often necessary to resort to any kind of elaborate apparatus to make out definitely the position and boundaries of the stomach, though there are doubtful cases in which some of these things prove of valuable assistance. Besides those previously mentioned, the x-rays can sometimes be used to advantage for the purpose of diagnosis. In the case of a patient with thin abdominal walls, a powerful x-ray apparatus in the hands of an expert will often produce a radiograph in which the outlines of the stomach can be clearly made out, provided a solution containing one dram of bismuth has been administered to the patient twice or thrice a day, some time before meals, for two

days preceding. When Turck's gyromele has been previously introduced into the stomach the result can be made still more satisfactory. The metal cable of this, inclosed within a tube, makes a sharp contrast with the surrounding part of the picture, and nearly always the gyromele may be depended upon to follow, and thus outline distinctly, the greater curvature of the stomach.

By repeated injections of a sufficient quantity of bismuth into the bowel the colon may be sufficiently coated with this material to assist in obtaining a fairly good radiograph of that viscus: but as in the case of the stomach the previous introduction of an elastic metal sound will give more definite results relative to the course of the colon, even if it cannot show its size or caliber.

In a patient with a not too sensitive intestinal mucous membrane, you may determine the position of the colon in its various parts (whether it be in contact with the stomach, or has dropped down below the latter) by filling it from below with a warm weak solution of salt (3 i to the quart), while he lies on the back or left side with the hips somewhat elevated. By injecting enough of the salt solution (or any fluid which can be retained a few minutes) you may be able to obtain a dull percussion note, or by auscultation with the stethoscope or phonendoscope while you tap over the different parts, you may hear gurgling or slight splashing sounds over the course of the colon, especially if it be dilated. For the success of this procedure it is necessary that the stomach should be wholly empty, so that any splashing sound could arise nowhere except in the colon or ecum.

CAPACITY AND MOTOR POWER OF THE STOMACH

Tests of the Capacity of the Stomach.—Among these there are some involving difficult mathematical calculations which require time and trouble out of proportion to the value of the information thus obtained. When the boundaries of the stomach are accurately determined, its capacity can usually

be inferred with sufficient exactness. One method of attempting to ascertain the capacity of the stomach, I mention here only to condemn. It is requiring the patient to drink as much water as possible, keeping a strict account of the amount taken and inferring thence what the capacity of the viscus is. This is not only an injurious method which by frequent practice could easily overdistend and dilate the stomach, but is also a nearly useless one, the amount of fluid which any person can be induced to drink at one time depending quite as much upon the tolerance of the gastric mucous membrane and the amount of discomfort which a patient is willing to bear, as upon the capacity of the stomach. It is conceivable that one strong healthy person with a stomach having a normal capacity of three pints might be able to overdistend it by drinking three and a half pints, while another one with a stomach having a capacity of three quarts might be unable or unwilling to drink over a quart before insisting that no more could be taken. Moreover, another element of uncertainty in such a test is the patulousness of the pylorus. In some persons the pylorus remains tightly closed during the whole time of the experiment, while in others the normal rhythmic opening of the same would permit of the escape of a considerable part of the fluid ingested during the time of observation. In still other cases the pylorus is stiffened by disease in such a way that it is continuously open, not being capable of complete closure, and in such cases a large part of the liquid ingested for the test would pass out during the experiment.

The salol test of gastric motility, concerning which much was formerly written, is not now depended upon by the best authorities. It was based upon the fact that salol is a compound of phenol and salicylic acid and is not decomposed in an acid solution such as normally exists in the stomach after meals. In feebly alkaline fluids salol is broken up into phenol and salicylic acid and assuming the stomach contents to be always acid after meals (which they are not, since in some cases of gastric atrophy no acid is formed there), the appear-

ance in the urine of salicyluric acid, a derivative of salicylic acid, would be a proof that the salol had passed beyond the stomach.

The test is thus carried out: The patient eats a small meal and half an hour later takes 1 gram of salol in two capsules, first having emptied his bladder. Then samples of urine are examined every half hour to determine when the violet color of the salicyluric acid first shows itself, indicating the decomposition and, therefore, the expulsion from the stomach of the salol capsules.

This would be a useful test if it proved anything certainly, but it does not. Experience has shown that though normally the violet color should be detectable in the urine by the end of an hour, it is often delayed much longer in healthy persons and vice versa.

Other Methods of Testing the Motility of the Stomach.—

Dehio's modification of the Piorry-Penzoldt procedure for determining the degree of gastric motor power has been referred to in the account of the author's method. Dehio has a patient drink one-fourth of a liter of water and then determines by percussion the position of the greater curvature of the stomach. Then in succession three like quantities of water are given and the position of the greater curvature is determined after the drinking of each portion. When the motility is normal, the stomach does not distend downward to any noteworthy extent, but the greater the motor insufficiency the lower will the stomach descend after each additional glass of water. This is unquestionably a method of much value and can be easily applied in most cases. The presence of a loud splashing heard over a large part of the stomach is one of the surest evidences of weak motor power in the viscus.

Another method is to introduce the tube at various intervals after some definite meal has been eaten—for example at five, six, seven, and eight hours after the Leube test dinner—to ascertain whether any fluid is then in the stomach. If at the end of five hours only a small quantity of chyme remains, the

motility would be shown to be good, especially if, at six hours or even seven hours, the stomach should be found to be completely empty. If food remains should be found at longer intervals after such a meal, they would indicate the probability of muscular insufficiency or deficient motility in the stomach, and the longer the time after the meal when such remains could be found the greater would be the muscular insufficiency to be inferred; yet, on the other hand, a deficient secretion causing very imperfect digestion can also delay the emptying of the stomach. There is an obvious fallacy, therefore, in this last method of testing the motility, and it really renders it untrustworthy unless a careful account be taken at the same time of the other conditions present. At least two other conditions besides the strength of the gastric musculature affect the length of time during which a meal remains in the viscus. These are the efficiency of the digestive glands and the proportion of acid present, not to speak of a possible mechanical obstruction at the pylorus. When the percentage of HCl and pepsin is so low that digestion proceeds very slowly and an abnormally long time elapses before the coarser particles of the food are dissolved, the emptying of the stomach may be much delayed, especially when mastication has been imperfect, since the pylorus does not readily open to permit of the expulsion of bulky particles not in solution. Again when the contents of the stomach are abnormally acid, whether from an excessive secretion of HCl by the gastric glands, the ingestion of an excessive amount of acid with a meal, or the development even of very large amount of organic acids in the stomach from fermentation of the food, there is frequently such a spasmodic closure of the pylorus as delays very markedly the time of emptying; and when there is a thickening of the structures about the pylorus, whether from hypertrophy of the muscle or a malignant growth, a narrowing of the outlet results with consequent delay in the expulsion of the gastric contents.

The chief value, then, of carrying out this method of Leube,

which has been considered the most reliable of the tests for gastric motility, is that thereby you may learn that there is, or is not, present some decided fault in the stomach—either in its secretory or motor functions or both. When by this test such a fault is discovered to exist, it becomes your duty to search further and ascertain the real cause. *E. g.*, when you wash out six hours after a hearty dinner and find a large quantity of semi-digested food with a very offensive odor suggestive of the swill barrel on a hot day, you can infer that the gastric secretion is deficient, and that probably the motor power is so also, since the amount of fermentation evident would be *prima facie* evidence that it must be at least considerably below normal. On the other hand if the tube readily brings away at the same interval after a generous dinner of meats and vegetables a large amount of perfectly digested fluid, especially if it has little odor, but tastes very sharply acid, and an analysis reveals HCl excess, you can decide that the case is one of hyperchlorhydria with likely a spasm of the pylorus delaying the emptying of the stomach, rather than deficient motor power in the gastric walls. But in a less marked case, showing a small amount of poorly digested stomach contents at the end of seven hours, with only a moderate deficiency of HCl and the ferments and not much evidence of fermentation, the diagnosis as to the gastric motility would remain in doubt. For the purpose merely of testing the gastric motor power, the simpler methods above described are manifestly about as reliable as any.

THE EXAMINATION OF THE SECRETORY FUNCTION OF THE STOMACH

LECTURE VII

INSTRUMENTS USED FOR THE EXTRACTION OF THE STOMACH CONTENTS

How to Introduce the Tube into the Stomach with the least possible Embarrassment of the Patient.—For diagnostic purposes you will usually introduce the familiar soft, flexible, rubber tube in order to bring up a sample of the stomach contents either an hour after the Ewald test breakfast of bread and tea or water, or two to four hours after a mixed meal consisting of either meat or eggs and a more generous allowance of carbohydrates, as will be found explained fully, further on, in the section devoted to test meals.

It is customary with many physicians to make use of the tube first for washing out the stomach, which is usually a somewhat tedious procedure and likely to be a trying one to the novice. Extracting a sample of the stomach contents, on the other hand, is a comparatively simple and littletroublesome task in a majority of cases when skillfully performed. This is especially true when a good aspirator is deftly used and the attempt is not made to extract all of the stomach contents, as is practiced by many specialists and taught in nearly all treatises upon the subject of stomach diseases. Even with the best intention it is often impossible to empty completely the stomach with the tube, some ounces of fluid nearly always remaining; and even if practicable it is not often desirable, particularly with a new patient. The knowledge of the gastric motility thus obtained is often inaccurate and misleading and

at all events could be obtained in other ways more easily and satisfactorily. (See preceding lecture on "The Author's Method of Outlining the Stomach and Determining the State of its Motor Function.")

To empty the stomach as completely as possible takes much more time and subjects the inexperienced patient to decidedly more annoyance than is necessary simply to obtain a sufficient quantity of the stomach contents for the purpose of making the usual tests. To do this is rarely a difficult or very embarrassing matter.

Select for first use ordinarily a tube not too large (not over a No. 28 or 30, French), highly polished, of medium flexibility and with a conical end, having an opening directly in the end, and at least one fenestrum on the side, about three-quarters of an inch above. It should have in it also somewhere two or

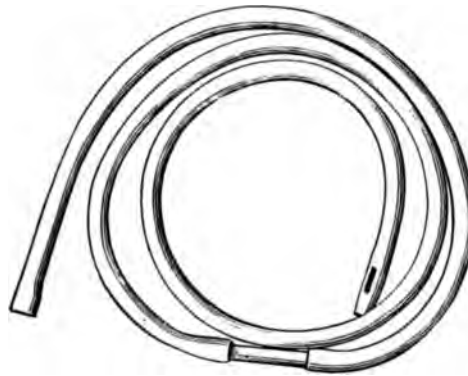


FIG. 19.—Flexible stomach tube with fenestrum attached.

three inches of glass tubing as a window. You will need larger tubes when extracting the stomach contents in cases of gastric catarrh or of food stagnation; also, if you should wash out at any time other than before breakfast.

As a lubricant for the tube, warm water answers well as a rule, though olive oil, butter, or glycerine is often used. The last named has the advantage of being sweet and odorless.

Preparation of the Patient.—It is best to prepare the new

patient for the introduction of the tube by a few words of preliminary explanation. If he has not been frightened concerning the procedure by an exaggerated account of it given by some foolish friend, the difficulty will be far less than when such a prejudice has been created against it. The less said beforehand about your intention to take up the stomach contents the better. My own rule is to ask the patient to eat a stale roll and drink a goblet and a half of water at 8.15 a. m., and be at my office at, say, five minutes after nine without mentioning for what purpose such a light meal is to be



FIG. 20.—Flexible stomach tube, with funnel attached.

taken. Caution is given not to take any other food or drink, or any medicine, that morning until after reaching my office. Then when the patient comes, he is told that I would like to have a few spoonfuls of his stomach contents and that he will need to swallow one end of a small and flexible rubber tube for that purpose. No display of the tube is made beforehand, and every effort is made to prevent the development of any excitement or fear. Then by 9.15, one hour after the patient began to eat his test breakfast, all should be in readiness for the actual extraction.

Having secured then the proper mental state, which should be as nearly as possible one of composure, devoid of excitement and apprehension, slip around the patient an apron,

preferably of thin rubber cloth and large enough to cover the body down to the knees. This should pass outside the arms (so as to prevent the hands involuntarily grabbing the tube at a critical moment) and be buttoned or tied behind the back. Then place him in a sitting position, in a good light, and sit down yourself in a lower chair in front, but a little to his right, so that if he should chance to vomit, you would not be in the way. Tell him now to open his mouth widely, hold his head bent a little forward (not far back, as most patients incline to hold it), and breathe regularly with unusual deepness; that the only reason, as a rule, why some persons are uncomfortable when they first take a tube is that their respiration is embarrassed as a result of a reflex irritation from the nerves of the throat, and that this can be usually avoided by breathing very deeply. Show him what you mean by taking a few strong inspirations yourself and, if doubtful of him, ask him to breathe as desired for a few moments before you introduce the tube.

Introducing the Tube.—Then, taking hold of the tube as you would a pen, about six inches from the stomach end, pass it carefully back over the center of the tongue into the pharynx. Use your sight, and not a finger of the other hand, to guide the end of the tube down through the middle of the pharynx into the esophagus. The moment it reaches the pharynx the patient must be induced to make several rapidly repeated swallowing movements, which will facilitate its entrance into the esophagus, down which it will glide easily with the gentlest pushing on your part, provided the patient continues breathing at least as deeply as normal and makes swallowing motions between times. Even without the swallowing the tube can in most cases be easily and safely pushed on into the stomach if full inspirations are kept up.

You will generally have difficulty in getting a tube into the stomachs of hard drinkers or heavy smokers, and will often fail altogether with them. Very nervous or hysterical women are also troublesome usually, but will occasionally sur-

prise you by the ease with which they swallow the little instrument for the first time; sometimes, however, one with extraordinarily heightened reflexes about the pharynx and very weak will power is unable to resist the impulse to seize and pull out the tube the moment it enters the esophagus, or even when it has already passed into the stomach and self-control for a second or two longer would enable a sample of the stomach contents to be obtained for analysis. In such cases it is indispensable that the hands be either well pinioned by a snug-fitting apron or held in the hands of an attendant, under the guise of sympathetic support.

It is unusual for patients to complain of any serious nausea as the result of the introduction of a tube, and I should say that not more than one in twenty is excited to vomiting by it. The annoyance usually is from embarrassed respiration, the patient feeling as though he could not breathe. There is apparently in these cases a real obstruction of the air passages, a result, according to Vierordt, of a spasm of the glottis. This can generally be overcome by voluntarily bringing into action the auxiliary respiratory muscles and making rhythmical forced inspirations. This relieves in a double way, (1) by diverting the attention of the patient from the passage of the tube and thus lessening the tendency to reflex spasmodic action, and (2) by powerfully expanding the lungs so as to obtain the entrance of air in spite of the contraction.

Training of Irritable Throats.—You will see cases occasionally in which efforts at deep inspiration will fail and the contractions of all the muscles about the pharynx and larynx will be so powerful that it will be impossible at first to insert any sort of a tube into the esophagus. In these very difficult cases I have often succeeded, after a few minutes of patient perseverance in the process of educating the oversensitive pharynx to the presence of the tube. This is best effected as follows: Tell the patient that you desire merely to accustom his throat to the novel sensation of having a tube in contact with it and that you will not attempt to pass it into the stomach until

after due notice. Then while the patient holds his mouth wide open with the tongue well forward, carry the end of the tube back and let it impinge gently against the posterior wall of the pharynx. There will be immediately a reflex contraction of all the parts, but continue to hold the tube there for a few seconds before withdrawing it. After a little delay insert the tube in the same way again and repeat this procedure three or four times if necessary, calling the patient's attention meanwhile to the fact that he has nothing to fear, as you do not intend to push the tube on further without notice. In this way the patient regains confidence and his morbid dread of the tube is largely overcome. After such a brief preliminary training it is generally quite practicable to pass the tube into the stomach successfully and often with very little inconvenience.

Most stomach tubes have rings marked around them to indicate how far they should be introduced. The idea is to push the tube on until the ring comes to the teeth. This is a poor dependence. The distance from the teeth to the bottom of the stomach varies in even healthy persons according to their height and peculiarities of build, and in conditions of displacement or dilatation of the organ, which are exceedingly common, especially in women, the tube may have to enter from one to possibly seven or eight inches beyond the mark. There are two ways of determining how far to introduce the instrument. The easier is to try it first at an inch or so above the mark, and if no fluid can be made to flow, gradually push it further, even if it is required to pass it to a point six or eight inches beyond the mark. When liquid will flow in, it must return if the tube has been passed to just the right point and not beyond it. To pass it too far is as bad as not far enough, since the end may then curl up and the opening emerge above the level of the contents.

The surer way is to determine first by one of the methods previously described where the bottom of the stomach is, and then, having measured the tube over the outside of the body, the distance necessary to insert it is readily seen.

Some authors speak of the possibility of the entire tube's being swallowed so as not to be recoverable without an operation. This could never happen with inexperienced patients, who are always trying rather to force the instrument out; and only the grossest carelessness could make it possible with an experienced one. The long tubes now mostly in use, reaching two to four feet outside the mouth, could not pass entirely into the stomach unless intentionally swallowed. With those having a bulb on them for the purpose of forcing air through when clogged, or a soft rubber funnel at the outer end, the accident would, of course, be out of the question.

As to the contra-indications for the tube, they will be few when you have become so expert as to be able to introduce it without letting the patient become unduly excited. But it will be wisest never to resort to its use soon after a hemorrhage



FIG. 21.—The Kuttner Aspirator.

from any internal organ, in cases of aneurism, in advanced lung disease, in serious forms of uncompensated heart disease, in conditions of great physical debility from any cause, or in the acute stage of gastric ulcer.

The Kuttner Aspirator.—Various kinds of pumps or aspirators may be employed for the purpose of emptying the stomach. The best is the kind in use in Ewald's clinic, and is the

invention of Kuttner, long Ewald's first assistant. These are now to be had at some of the instrument makers in the United States, and a cut of one is herewith shown. I imported one in 1895, and was the first writer in this country to describe and recommend it. It is similar to the Politzer air bag, only larger, of thicker rubber, and without any valve at the top. It is first compressed with the hand, and, while held so, the nozzle is introduced into the end of the tube. Then, when allowed to

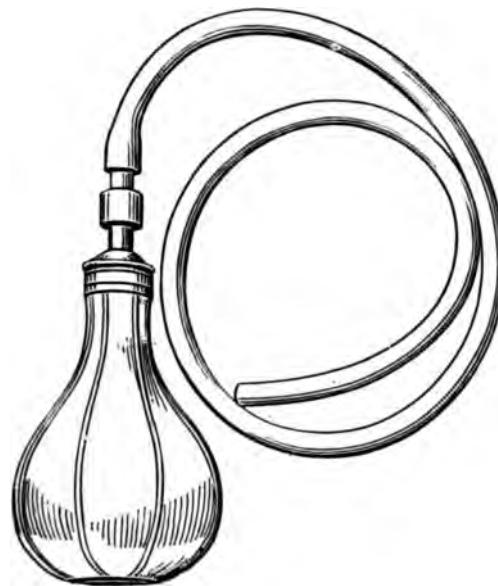


FIG. 22.—Kuttner aspirator with tube attached.

expand, after being carried down to a point below the level of the lower border of the stomach, sufficient suction is exerted, with the help of siphonage, to empty the contents of the stomach with a minimum of disturbance or inconvenience to the patient.

If the tube should be blocked with mucus in passing down, as sometimes happens, no contents will flow out. In this case you should disengage the bulb, and attach it to the tube again without compression. Then, by compressing it, you will force

its contained air downward through the tube and thus clear out the obstruction. The air thus forced into the stomach causes little or no inconvenience though, exceptionally, enough of it may return with the fluid contents to fill the bulb and prevent a complete emptying. You should then detach the bulb again and introduce it compressed. This, provided the tube has been inserted just far enough, rarely fails to bring up either all the contents, or 15 to 30 c. c., which are enough for all the necessary tests. If not, the difficulty may be that the stomach contents have passed prematurely into the duodenum as a result of excessive peristaltic action or pyloric insufficiency.

LECTURE VIII

TEST MEALS AND PREPARATIONS FOR TESTING THE STOMACH CONTENTS

Concerning Test Meals.—In order to determine the secretory activity of the gastric glands it is customary to make chemic and microscopic tests of samples of stomach contents obtained as nearly as possible at the height of the digestive process, which is about one hour after the Ewald test breakfast, or from two or four hours after mixed meals including meat, vegetables, bread, etc., the exact length of time depending upon the size of the meal. About two hours and a half after the average hearty American breakfast answers well. When vomiting chances to occur, especially at a suitable interval after eating, the vomitus can be utilized for the purpose of the examination. This, however, will generally give less accurate results, since the fact of vomiting presupposes an exceptionally disturbed condition of the stomach at the time and moreover it is rare that the patient happens to vomit at the period when digestion is at its height. Ordinarily, therefore, test meals of some kind are employed for the purpose of obtaining samples of the stomach contents for examination.

The Ewald Breakfast.—A convenient meal, and that which is in most frequent use in both Europe and America, is the Ewald test breakfast. It consists, according to Ewald himself, of an ordinary stale roll and one-third of a liter—about two-thirds of a pint—of fluid. The fluid may be either water or weak tea, without sugar or milk. Tea is that most usually ordered by Ewald and his assistants at their clinic in Berlin. A goblet and a half of water, not ice cold, answers the purpose quite as well, and is what I usually order for my own patients.

In place of the roll, two moderate slices (or a little less than two ounces) of stale bread, or even half a dozen water crackers, not soda crackers, will suffice.

Such a meal should, under normal conditions, uniformly digest into a thin grayish liquid at the end of one hour from the time the patient begins to eat, and it is then you should withdraw the contents for examination and chemical analysis.

The Test Dinner.—Leube and Riegel have recommended and used largely a test dinner to be taken in the middle of the day. It consists of 400 c. c. (13 fluid ounces) of soup, 60 grams (2 ounces) of beef, and 50 grams (1½ ounces) of wheat bread or a roll. Sometimes a potato is added. The time for the examination of this meal is about three hours afterward.

The ordinary American generous mixed breakfast, with meat, bread or rolls, potatoes and coffee, approximates closely the Leube test meal, and in the case of new patients who present themselves for the first time two to three hours after such a meal, you may find it convenient to empty the stomach at once for the purpose of analyzing the contents, thus gaining, without delay, important and sufficiently reliable information. But when such patients can return at another time, you should have them, if possible, take subsequently the usual Ewald test breakfast, which affords valuable data for comparison especially since it has come to be accepted as the standard the world over.

Do not make the mistake which is sometimes made of attempting to take up such a mixed meat meal at the end of one hour, since it will then be so little digested as not to pass through any ordinary tube without great difficulty. Pouring water into the tube may facilitate the process, but spoils the results of the analysis. Moreover, testing the stomach contents before digestion has reached its height would not afford results of value.

The Lactic-Acid-Free Meal.—The only other test meal of which it is worth while to tell you is the Boas non-lacteal one

for the purpose of testing for lactic acid in suspected cancer of the stomach. Boas advises washing out the stomach at bedtime to remove all traces of previous food, and then, in the morning following, the patient takes six to eight ounces of thin, well-cooked oatmeal porridge, which is prepared and served without milk, cream or sugar. An hour afterward this is brought up in the usual way. Boas' idea was that all breads, rolls, etc., contain milk enough to contaminate the product with lactic acid. But the view formerly advanced by him, that even a very small percentage of lactic acid formed in the stomach is a sign of gastric cancer, is no longer accepted. Boas, however, still maintains, and with much clinical evidence in his support, that a decidedly large amount of this acid in the stomach, when not introduced with the food, must raise a strong suspicion of the existence of carcinoma. It is only exceptionally in the worst forms of chronic gastric catarrh, with great stagnation and an unusually excessive amount of fermentation, that a large proportion of lactic acid is found in the stomach without the presence of cancer. Lactic acid cannot by the usual simple tests be demonstrated in the stomach contents in the presence of free HCl.

No Single Test Meal Conclusive.—No one of these test meals is sufficient of itself to determine accurately the secretory activity of the gastric glands. The Ewald test breakfast is nearly identical with the first breakfast of a large proportion of people in Germany, except that as a rule many eat butter with their bread and drink coffee instead of tea, while a certain proportion of persons add one or two eggs. This small meal, therefore, tests with substantial accuracy the secretory activity of the gastric glands in Germany and in many parts of Europe where the inhabitants habitually break their fast in the morning with such a light repast. In the United States, where most persons begin the day with a hearty meal including nearly always either meat or eggs, it does not supply to the stomach its accustomed early morning food. When a person whose usual breakfast consists of a large beefsteak, two cups of

strong coffee, a dish of fried potatoes, and hot griddle cakes or soda biscuit with butter, suddenly substitutes a roll and ten ounces of tea or water, the gastric glands are likely to secrete an amount of HCl and pepsin in excess of the requirements of such a slender meal and might, therefore, show a decided HCl excess which would not be apparent after his usual breakfast. Hence, while in important cases you should make one test by this accepted standard, do not depend upon it entirely.

Then again it is a fact long since observed by me, and noted also by other observers, that the stomach of the same person will secrete far different amounts of gastric juice not only after meals of different size, but also at different times of the day. For example, some persons secrete but little gastric juice in the early part of the day, but more liberally of the same toward evening. On the other hand, the reverse is true of certain other persons. That is, patients have been frequently examined by me who after an Ewald breakfast in the morning had a large amount of HCl in the stomach contents, whereas in the latter part of the day, owing apparently to a partial exhaustion of the nerve centers, the gastric secretion was markedly insufficient.

An Objectionable Method of Getting the Stomach Contents.—It is still advised in some works to empty the stomach by what is called expression when an analysis of its contents is to be made. That is, a medium-sized tube is passed into the stomach, and the patient, with both hands over the epigastrium, is urged to make straining efforts. By holding the breath and active contractions of the diaphragm, the contents of the viscus are sought to be forced up through the tube. This generally succeeds in time in accomplishing the object, but in most cases only after such an amount of serious discomfort, dyspnea, retching and often vomiting, as must disgust any patient. Indeed, this obnoxious method of getting up test meals and unskillful ways of performing lavage are largely answerable for the very general, though needless, dread of the stomach tube.

Extraction, however, with the Kuttner bulb already described is a very simple matter, and after the tube has been swallowed, requires usually a few seconds only with the patient remaining entirely passive. It is accomplished still more easily and rapidly when the latter voluntarily assists by swallowing movements and deep breathing.

The Macroscopic Examination of the Stomach Contents.—

In conformity with my plan to describe methods that accomplish as much as possible for the purposes of both diagnosis and treatment by the simplest means with no more instrumentation than absolutely necessary, I strongly advise you to accustom yourselves to a careful study of the gross appearance and other manifest characteristics of the stomach contents, whether these be vomited or extracted especially for testing. In patients who are used to the tube and not too much inconvenienced by it, it is often advisable to extract all of the stomach contents that can be obtained in this way.

For reasons hitherto explained this is not advisable on the occasion of the first introduction of the tube into a patient's stomach for diagnostic purposes. But whether you bring up all the contents that can be obtained or seek only to extract enough for the usual qualitative and quantitative tests, great differences may be observed in the amounts of the contents that will readily be extracted. In exceptional patients with hypermotility, in whom the expulsive powers of the stomach are unusually strong and the obstacles to the emptying of the viscus less than usual, you will frequently obtain no contents at all if you wait until the end of an hour, as is the usual rule. In these you will find it necessary to take up the contents at the end of forty or forty-five minutes. In patients having a normal gastric motor power and no hyperacidity to complicate matters you may ordinarily obtain an hour after the Ewald test breakfast has been begun, from half an ounce to 1½ ounces (15 to 45 c. c.) of filtered contents. In many first attempts with new patients under such circumstances you may obtain even without attempting to empty their stomachs entirely, a

considerably larger amount than the above maximum, and in your trained patients, when you endeavor to empty their stomachs completely, you will very frequently be able to obtain two to four times the normal amount. If this excessive amount consists of a thin watery fluid containing no solid particles and having no particular odor, except perhaps that of new bread, you can infer at once that you are dealing with a case of HCl excess (hyperchlorhydria) and possibly gastric ulcer. This inference as to HCl excess would be confirmed if the patient should complain of a sharp acid taste when the liquid comes into the mouth.

If the excessive contents obtained should consist of a foul-smelling mixture of a fluid having numerous fragments of meat or undigested bread or vegetables as well as considerable amounts of mucus floating through it, you could infer with almost equal certainty a dilated stomach with deficient HCl (hypoacidity) and probably advanced gastric catarrh. You might think then also of possible cancer. The inference that you were dealing with hypoacidity and possibly gastric catarrh or cancer would be strengthened if the patient should report no particularly sharp, sour taste of the fluid passing through his mouth and only a disgusting and bitter taste with possibly a slight sourness, such as may be produced by an excess of organic acids and revealed to both taste and smell. The latter sort of stomach contents when allowed to stand in a conical glass usually separates into several layers, the uppermost one being frothy on account of the large content of gas from fermentation. Beneath this is a layer containing much oil and still lower the heavier liquids with undigested particles of food suspended in them. Finding an excess of material in the stomach, except when there is obstruction to the outflow by a spasm of the pylorus, or from other cause, is *prima facie* evidence of deficient motor power in the gastric walls and often means, as was mentioned before, dilatation of the stomach (gastrectasis). In these cases several quarts of decomposing contents may sometimes be obtained from the stomach.

Chronic gastritis does not necessarily coexist with this condition, though it often does, and in such cases you will find mucus mixed with the stomach contents. It is proper to repeat here, however, that the finding of considerable amounts of mucus in the stomach does not of itself prove the existence of gastritis or catarrh of the organ. The catarrhal process may be situated in the nose or throat and the mucus merely swallowed.

Bile, Blood, Feces, or Pus in the Stomach Contents.—

Besides considerable amounts of mucus and of undigested food, other morbid constituents usually recognizable by the naked eye may be present, such as bile and blood, or when present in large quantities, pus. Feces dependent upon obstruction in the lower bowel or upon a fistulous opening from the stomach into the intestines may often reveal themselves both to sight and smell. A recent hemorrhage from any part of the interior of the stomach, if considerable, may always be recognized macroscopically as well as microscopically. When the quantity is very small or the blood has undergone changes, it may require a chemic or microscopic test to demonstrate its presence. Blood found in the stomach contents may have come from the lungs or any of the parts above, and been swallowed, but when its origin is in the stomach itself it most frequently signifies ulcer or cancer. It may arise from cirrhosis of the liver, exceptionally as the result of so-called vicarious menstruation, and still more exceptionally from swallowed poisons or foreign bodies, from aneurisms or varices in the stomach walls, from severe forms of anæmia, or from certain acute infectious diseases or constitutional dyscrasiæ. (See Lecture LVIII.)

The fluidity of the stomach contents is more important than the quantity obtained, so far as concerns the secretory function of the viscus. When the gastric juice is normal in quantity and activity, the stomach contents should be a somewhat viscid fluid resembling rich milk in consistency. They should be of a grayish color after the Ewald breakfast and will vary in

color after other meals according to the character of the food taken, being yellowish after a meal consisting largely of eggs and much darker after a meal of meat and vegetables. When the gastric juice is very strong in HCl and pepsin, the contents are likely to be thinner and more fluid than normal, flowing almost as freely as water, and rapidly filtering unless mixed with much mucus. An admixture of mucus always delays filtration. The more deficient and inactive the gastric juice, as in hypochlorhydria and hypopepsia, the less perfect will be the solution of the stomach contents. Instead of perfect fluidity there may be a mushy condition, the chyme being so thick that it will scarcely flow through the tube, or it may contain portions of fluid mixed with but slightly changed bread crumbs or unchanged pieces of other food. Thus it may be seen that the experienced gastrologist scarcely needs to make the usual chemic and microscopic tests in order to recognize very marked departures from the normal in either direction; but such tests are very valuable whenever it is desirable to have an accurate knowledge concerning the great majority of cases in which the stomach contents will be found to occupy a middle ground, partaking of the character of neither extreme.

A bright yellowish or greenish-yellowish tinge to the stomach contents may result from bile, or, according to Knapp, from succinic acid, and elsewhere the means of making a differential diagnosis between these is explained. Bile is always present in the small intestine, and can be recognized by Gmelin's test or by Pettenkofer's test for the bile acids. Its reflux into the stomach indicates a relaxed condition of the pyloric valve, or else obstruction of the intestine below the entrance of the bile duct. A considerable amount of pus in the stomach contents, recognizable by the naked eye, would mean usually a serious abscess in the gastric wall or esophageal wall; but smaller amounts of pus discovered by the microscopic examination may have been swallowed, having their origin then in ozena, disease of the gums, or some other inflammatory condition in any of the parts above.

Filtering the Stomach Contents. — Having obtained a sample of the stomach contents whether by means of the instruments already described or by vomiting, and studied carefully its gross appearance macroscopically, your next step should be to filter it. Chemists and other trained laboratory workers will not need instructions concerning these minor details; but in these lectures I am addressing myself especially to students and general practitioners, for whom it is particularly desirable to make everything as plain as possible.

Procure a good quality of filter paper and cut into squares, or better, circles, about eight inches in diameter. Fold one of these in such a manner that it will form a cone with folds radiating in every direction from the apex. Put this inside a glass funnel of three or four inches' diameter, and place the latter in any convenient wide-mouthed bottle. Empty the sample of stomach contents obtained, or a sufficient quantity thereof, into this funnel and set it aside to filter. Provided there be a good quantity of it and a large amount of mucus be not present, filtration will go on rapidly, so that within fifteen or twenty minutes you should have enough of the filtrate to enable you to make not only the indispensable simpler qualitative tests, but also if need be, some of the quantitative tests.

When the contents are very viscid you will save much time by using a filter pump or suction pump, which can be readily attached to the faucet and is not expensive. You can then insert the funnel into a rubber stopper which closes a filtering flask, the latter being connected with the filter pump by means of rubber tubing. In the absence of a water supply, an ordinary hand aspirator may be connected with the filter bottle, and sufficient contents filtered by compressing the bulb several times. The filter should be protected from tearing by placing a plug of absorbent cotton at the bottom of the glass funnel. A platinum cone is preferable for this purpose, but is expensive.

LECTURE IX

QUALITATIVE TESTS OF THE STOMACH CONTENTS

The Simpler Tests for HCl.—If a strip of congo-red test-paper dipped into the extracted stomach contents or vomited matter is changed to a decided blue or blue-black color, it means free acid of some kind and nearly always free HCl. If the change is not well marked it may mean free organic acids such as result from fermentation. Adding now a drop or two of a one-half per cent. alcoholic solution of dimethyl-amido-azo-benzol (to be obtained of Merck, or any wholesale chemist) will produce a bright cherry-red color if the free acid should be HCl. This test may prove misleading in the rare contingency of there being present 0.2 per cent. or more of lactic acid, or in case of a very large excess of any of the organic acids, which may produce a similar color. If in doubt, you should test also by the Güntzburg reagent, which, as modified by Boas, is composed as follows:

R	Phloroglucin.....	2.00
	Vanillin.....	1.00
	Alcohol (80 p. c.)	100.00
	M.	

This should have been recently prepared, else it cannot be depended upon.

To test the free HCl add a full drop of this to a very small drop of the stomach contents on a porcelain dish (a butter plate will answer) and heat slowly over a small flame. If free HCl be present, a brilliant carmine hue will be developed as the liquid evaporates. This is the most reliable test. The red

color with this test is not produced by anything except a free mineral acid, and HCl is the only free mineral acid to be found in the stomach unless taken in through the mouth.

It is desirable in many cases to make the Uffelmann test for lactic acid. If no reaction pointing to free HCl has been obtained, or if, with the dimethyl, etc., reagent, you have obtained a reddish color, but are uncertain as to its significance, you should always make it. The test is carried out as follows:

Test for Lactic Acid.—Add 10 c. c. of a 4 per cent. solution of carbolic acid to 20 c. c. of water in which a drop of the officinal solution of the chloride of iron has been dissolved. Now pour equal quantities of the blue liquid which results into each of two test tubes. To one of these add drop by drop a quantity of the stomach contents. If any notable proportion of lactic acid be present, the blue will be replaced by a peculiar greenish—or citron-yellow color. The change to an ordinary yellow color does not signify lactic acid. The presence of free HCl or of much peptone may prevent this reaction, and oxalic or citric acid, alcohol, phosphates, or dextrose might possibly mislead by giving a somewhat similar reaction, but are rarely present in sufficient quantity one hour after the Ewald breakfast. In any case, two of the tests just described should give conclusive results. Thus, if there be a reaction with the dimethyl, etc., and none with the Uffelmann test, there is free HCl and no important proportion of lactic acid present. If there should be a decided and unquestionable response to the Uffelmann test, with or without a reaction to the dimethyl reagent, the presence of a considerable amount of lactic acid would be shown, pointing to either cancer or advanced gastric catarrh with much stagnation and fermentation. In such a case the Güntzburg and other confirmatory tests should always be made, and a thorough exploration of the stomach by an expert, both externally and internally, would be desirable.

Whenever the various tests show an absence of free HCl, you should always make the foregoing test for lactic acid, since

it may be present in such cases in considerable proportion and may then mean cancer of the stomach, though it is not proof positive of that disease. A very decided response to the Uffelmann test must always raise the suspicion of cancer, or tend to confirm such a suspicion when a tumor can be made out.

When, from any cause, the result of the Uffelmann test is uncertain or it is desired to make the test with unusual care, you may practice the following modification of it: Place in a stoppered separating funnel 5 to 10 c. c. of the filtered stomach contents and add twice the amount of pure sulphuric ether, being especially careful that it is free from alcohol. Shake this well several times during an interval of twenty minutes and then let it stand until the liquids separate into different layers. Then allow the ether to evaporate, a process which can be hastened by placing it over a hot-water bath. The residue should then be dissolved in 10 c. c. of water and the solution tested for lactic acid according to the method above given. This is more delicate than the simple Uffelmann's test without ether and gives a much more decided reaction to even minute quantities of lactic acid than does any of the substances before mentioned as liable to cause similar and misleading reactions.

A very quick and convenient method of determining roughly when lactic acid is present, is to add two drops of the officinal chloride-of-iron solution to a medium-size test tube filled with distilled water, pour one-half of this into another test tube of the same diameter, and then add to one of them several drops of the filtered stomach contents. If lactic acid be present, the liquid in the test tube to which the filtrate was added will show the same greenish-yellow color described as produced by the usual Uffelmann's test. This is the method of testing for lactic acid which I found much used in Ewald's laboratory in Berlin, and it answers well enough in cases where great exactness is not required.

Tests for the Other Organic Acids.—Whenever large quan-

tities of the organic acids are present in the stomach contents at the usual time after extracting any of the test meals, fermentation has been taking place to an abnormal extent, except, of course, when these acids have been ingested with a meal. Butyric, acetic, and succinic acids may any of them be found when there is excessive fermentation, and the differentiation of them is not generally of great consequence except that it enables you to exclude from the diet, in so far as practicable, those articles which are most prone to the kind of fermentation thus shown to exist. The two former are easily recognized by the odor, acetic having the odor of vinegar, and butyric that of rancid butter. Acetic acid, after being carefully neutralized, gives a blood-red reaction on the addition of a drop or two of a solution of chloride of iron. Butyric acid, on the addition of a small piece of chloride of calcium, may reveal itself in the form of small drops of oil. Succinic acid is a product of mold formation in the stomach, and Knapp¹ considers it indicative of a somewhat serious form of fermentation. He believes that it is oftener present than generally supposed, being mistaken for bile on account of the greenish-yellow color with which it tinges the stomach contents. It may be recognized by producing a dark mahogany ring when an ethereal extract of the chyme is floated on a 0.1 per cent. solution of ferric chloride in water.

Tests of the Salivary Digestion.—Normally the ptyalin of the saliva begins to act in the mouth during mastication, and the action continues in the stomach before the contents of the latter become too acid, and the conversion of the starchy part of the food is carried through various stages up to the form of sugar known chemically as maltose. To test the extent to which starch digestion has thus progressed, you should put a few drops of the stomach contents on one side of a small plate, such as a butter-dish, and a short distance away from it one or two drops of Lugol's solution, which is prepared as follows: iodine, 0.1; potass. iod., 0.2; water, 200 c. c.

¹ *Med. Rec.*, September 6, 1902.

Then, by tilting the dish, let the two fluids come together, and note the color changes as they mingle. A blue color would indicate either wholly unchanged starch or starch advanced one stage in digestion to amyloextrin. Any shade of violet, red, or a mahogany brown, would indicate that the starch conversion had progressed to the next stage, known as erythroextrin. If the process has progressed still further, the fluids will have the yellowish color of iodine, and the product of the starch thus far digested is known as achroöextrin. This is as far as the color reaction can help us in recognizing the degree of starch conversion, but when maltose has been formed it can be recognized by the usual tests for sugar. Normally, the starch in an Ewald test breakfast should, at the end of an hour, show either a yellowish or brownish tinge with the iodine and not a blue one.

A more delicate way of carrying out this test is to put about 2 c. c. or more of the filtered contents in a test tube and pour 2--3 drops of the Lugol's solution on the side of the inclined tube. As the two solutions mingle, a play of colors results. If in doubt as to the tint, mix the two solutions and dilute with a considerable quantity of water. The slightest tint can then be appreciated.

Tests for Pepsin and the Rennet Ferment.—To test for pepsin, add to 5 c. c. of the filtered stomach contents one of the disks of albumin to be had of the dealers or small fragments of coagulated white of egg, and if there be no HCl present, add 2 or 3 drops of this acid and set aside. When pepsin is present in the usual amounts, the albumin should be all dissolved in the course of five to six hours, and the more rapidly it dissolves, as a rule, the larger is the proportion of pepsin. You can prepare suitable disks of albumin, one-sixteenth inch thick and one-quarter inch in diameter by cutting them out of the white of a hard-boiled egg. A supply of these should be kept on hand in 50 per cent. glycerin. Wash these disks well before using.

You may test for the rennet ferment as follows: **Neutralize**

5 c. c. of the filtered stomach contents by the addition of a solution of caustic soda until blue litmus paper is no longer reddened by it. Then add 5 c. c. of fresh pure milk, which should, if necessary, also be rendered neutral in reaction. Shake the mixture well and let it be kept at about the body temperature, either in an incubator or a glass of warm water (about 40° C.). If rennin is present in normal proportions, a firm coagulum should form in ten to fifteen minutes. A slower reaction would indicate a deficiency of the rennet ferment, and an entire failure of coagulation, the absence of such ferment.

Tests for Albumin, Propeptone, and Peptones.—The more completely any sample of stomach contents is digested the less albumin there should be present, and you may learn something therefore concerning the degree to which the digestive process has been carried by putting 4 or 5 c. c. of the filtered stomach contents into a test tube and boiling it over a Bunsen burner. Then set aside, and the amount of the deposit shows the proportion of albumin. Neutralize exactly by adding a weak solution of caustic soda, which precipitates the syntonin. Then filter the contents of the tube in order to get rid of the coagulated albumin and the syntonin and make the test for propeptone and peptones which will show roughly to what extent the digestion of proteids has been carried. After filtering, add to the filtrate an equal quantity of a saturated solution of sodium chloride—common salt—and shake well. If propeptone is present it will be precipitated and the more turbid the mixture becomes the larger is the amount of the propeptone. Then the addition of a few drops of commercial acetic acid will reveal flocculent masses when this is present. To test for peptones filter out any propeptone that may have been found and proceed thus with the filtrate: Render the liquid decidedly alkaline by the addition of a sufficient quantity—3 or 4 drops—of the one-tenth normal sodium hydrate solution to be referred to later under the head of Quantitative Analysis. Add also one or two drops of a 1 per cent. sulphate of copper solution. If then peptones are present, what is called the biuret reaction

is caused, which produces a rose red, purplish, or strawberry tint in the liquid.

EXTERNAL METHOD OF TESTING FOR GASTRIC ACIDITY

A Further Development of the Benedict Effervescence Test.

—During recent years I have made a large use of Dr. A. L. Benedict's effervescence test for gastric acidity, and have found it of distinct value, especially in cases in which the stomach tube could not be introduced. It is an ingenious and very simple method.¹ As described by him in various communications, it consists essentially in administering to the patient at the height of digestion—say an hour after the Ewald breakfast—a sufficient quantity of sodium bicarbonate dissolved in water, and then, with the stethoscope previously in position over the epigastrium, noting the amount of effervescence produced as revealed by the resulting crackling or bubbling sounds. When a notable amount of these sounds can be heard through the stethoscope one may always infer the presence of some free acid in the stomach, and when an unusually large amount of effervescence is thus demonstrable, the amount of free acid present is manifestly correspondingly large.

The objection has been made that this free acid need not necessarily be hydrochloric, but may be some one, or a combination, of the organic acids produced by fermentation. This is possible in rare cases, when fermentation is very excessive, as in cancer or aggravated catarrh; but the skilled diagnostician can usually determine whether or not much fermentation is going on in the stomach. In such a case there is likely to be a heavily furred tongue, bad breath, poor appetite, troublesome eructations, and marked gaseous distention of the stomach, while most of these symptoms are usually absent, or present in a slight degree only, when the percentage of HCl in the stomach contents is either normal or excessive. They are

¹ "The effervescent Test for Gastric Acidity," by Dr. A. L. Benedict, *International Medical Magazine*, June, 1903.

never, according to my experience, all found coexisting in either of the latter conditions; and they are, on the other hand, very generally all to be noted in marked cases of organic fermentation when free HCl is absent or deficient.

Moreover if, in a doubtful case, the stomach be well washed downward by causing the patient to drink a pint or more of hot water in the morning, and then, half an hour later, an Ewald breakfast be eaten, only a very small portion of organic acid will usually form within an hour. Any notable effervescence produced by the soda at the end of an hour would thus necessarily come from HCl.

Therefore, the test in the hands of an expert is one of real value for the many cases in which, for any reason, it is impracticable to introduce the tube in order to extract the stomach contents after a test meal.

The Percussion Note before and after Drinking a Solution of Soda.—I have developed this ingenious method a little further by briefly noting carefully before administering the soda how much resonance there is on percussion over all parts of the stomach, and then again after the patient has swallowed the soda solution and a few minutes have elapsed to permit of its chemical combination with any acid present. The difference between the percussion note before and after this little procedure is very striking, whenever the percentage of the HCl present is either normal or excessive. I have demonstrated this fact many times by inflating the stomach with soda solution for the purpose of mapping out the boundaries by a combination of methods already described by me in Lecture VI., and then, on the following day, giving the test breakfast and analyzing some of the gastric contents in the usual way. Indeed, it is my uniform custom now in determining the size and position of the stomach to administer first three-fourths to a teaspoonful of sodium bicarbonate dissolved in a goblet of water, at the height of digestion if possible, and note whether any tympany results without the further giving of an acid. If tympany is thus produced,

it affords me an early evidence of the probable presence of abundant HCl, and I can proceed at once with my work of mapping out the boundaries. If no tympany, and not even a moderate increase of resonance, results, I administer additionally 8 to 12 drops of strong HCl in solution (which I find far preferable to tartaric acid) and proceed with my percussion. At the same time, I am forewarned that the amount of free HCl in the stomach is likely to prove deficient; and this approximate diagnosis is nearly always verified by the subsequent chemical test.

When the soda solution, given near the height of digestion, produces no increase in the epigastric resonance, especially after the region has been gently kneaded for a few moments, it is positive evidence that there is very little or no free acid in the stomach. But this can be further confirmed by letting the patient immediately afterward drink a solution of 8 to 12 drops of strong HCl, when effervescence will result with not only the auscultatory phenomena described by Dr. Benedict, but also the development of tympany over the gastric region.

The above method of course lacks the definiteness and exactness of a careful chemical analysis, and is only to be recommended as a substitute when the latter is for any reason impracticable.

LECTURE X

QUANTITATIVE ESTIMATIONS AND MICROSCOPIC EXAMINATIONS OF THE STOMACH CONTENTS

The More Important Quantitative Tests of the Stomach Contents here described can be readily made by anyone possessing even a minimum amount of chemical knowledge.

The only additional apparatus absolutely required is a graduated cubic-centimeter measure and a burette, which can be obtained at a trifling cost. (See accompanying illustration.)



FIG. 23.—Burette for quantitative analysis.

Premising that you have already made the Güntzburg qualitative test for free HCl , I will now state how you may determine most readily, by a series of associated tests, the quantities present of (1) free HCl ; (2) combined chlorine (*i. e.*, the

HCl loosely combined with the albuminoids of the food) ; and (3) the total acidity or sum total of all the free and combined acids, mineral and organic. This is called Töpfer's method, and, while less scientifically accurate than some of the very elaborate ones, it is reliable enough for practical clinical purposes in all cases in which even a trace of free hydrochloric acid is present, and also in other cases, except those in which there is at least 0.2 per cent. of lactic acid, or a large excess of the other organic acids present, as shown by the characteristic odor of vinegar or butyric acid.

In chronic, painful, or flatulent indigestion, the treatment, medicinal, dietetic, and mechanical, should be very different, when there is a deficiency of HCl, from that imperatively demanded when there is persistently a decided excess of the same, as happens in a large proportion of all such cases.

The total acidity is equally important. When there is an absence of free HCl acid, even though the amount of the combined chlorine should not have been determined, the finding of a high total acidity—above 60—would point to an excess of organic acids from fermentation, while a very low total acidity—15 or below—would speak in favor of either more or less complete gastric atrophy, or a temporary paralysis of secretion from some one of various possible causes.

For the Töpfer test you will need, in addition to the burette with graduated measures, pipettes and cups or beakers holding two or three ounces, several chemical solutions, as follows: one-tenth normal solution of caustic soda which should be prepared by a thoroughly trained chemist, since very much depends upon its absolute accuracy; but you can obtain usually from any reliable dealer the normal soda solution and dilute, by adding one part to nine parts of distilled water. Such a solution, when long exposed to air, becomes weakened by chemical changes, and it should therefore be kept in small bottles well corked and always full up to the cork. The burette must be filled with this, preferably up to the zero mark, before beginning; then, besides, the following three

solutions to be used as indicators: (1) one-half per cent. alcoholic solution of dimethyl-amido-azo-benzol; (2) a 1 per cent. watery solution of alizarin, which is known chemically as alizarin monosulphonate of sodium; (3) a 1 per cent. alcoholic solution of phenolphthalein.

No. 1 does not react to combined HCl or acid salts of any kind, nor to moderate amounts of the organic acids, especially in the presence of peptones, but gives a brilliant red color with the faintest admixture of HCl in the free form.

No. 2 produces a clear violet color when mixed with a solution containing any of the acidities to be found in stomach contents, except that arising from the presence of combined HCl, or, as Van Valzah and Nisbett well express it, alizarin "is sensitive to all the factors of gastric acidity except the combined HCl."

No. 3 only produces its characteristic dark red color in the stomach contents when all the elements of acidity, including free and combined acid of every kind, have been neutralized by the soda solution.

To make the three tests, (a) measure into a beaker, or glass of any kind, 10 c. c. of the filtered stomach contents (though 5 c. c. will answer for each of the tests, when an insufficient amount of the contents has been obtained) and add to it two or three drops of the No. 1—dimethyl-amido-azo-benzol. A brilliant carmine color is produced if there be the slightest proportion of free HCl present. If this results, place the beaker over a white surface and add the soda solution from the burette, drop by drop, till the bright red begins to fade to a dingy, reddish yellow. This shows that all the free HCl has been neutralized. Be careful to stop when the fading from the bright red first becomes decidedly apparent. Suppose the result of this process (called technically a titration) to show that 2.5 c. c. of the standard soda solution were necessary to neutralize 10 c. c. of the gastric contents. This would be equal to ten times 2.5, or 25 c. c. of the solution for 100 c. c. of contents, and all such calculations are made upon the basis

of 100 c. c. The amount of free HCl would, in this instance, be expressed arbitrarily by the figures 25 by some authors, while others figure out the exact equivalent percentage of free HCl by multiplying the finding 25 by the fraction .00365, which has been found to represent very nearly the amount of HCl which each c. c. of the soda solution will neutralize. Making this multiplication thus, $.00365 \times 25 = .09125$, we obtain the decimal fraction .09125 as expressing the percentage of free HCl present.

(b) Next, to 10 c. c. of the stomach contents add two or three drops of the No. 2 (alizarin solution) and titrate, that is, let the soda solution flow into the mixture, drop by drop, until it changes it to a clear violet tint. Suppose 6 c. c. of the soda solution to have been used in this titration, we multiply by 10 to find the aggregate amount of the free HCl, organic acids and acid salts, but not including the combined hydrochloric acid, *i. e.*, the HCl combined with the albuminoids of the food. It will be remembered that alizarin reacts to all the elements of acidity in the stomach except the combined HCl. We have then obtained the figure 60 as representing conveniently the amount of these combined acidities in 100 c. c. of the fluid being tested. As only a small part of this is composed of HCl in any form there is clearly no excuse in this instance for multiplying the figure 60 by the fraction .00365 to obtain its equivalent value in terms of HCl.

(c) We determine by a third titration the aggregate of all the acid elements, mineral and organic, free and combined, in the fluid under examination, to obtain what is called its total acidity. This is the procedure:

To 10 c. c. of the fluid in a third vessel we add two or three drops of the No. 3 (phenolphthalein) and allow the soda solution to flow in as before. Soon a circle of red will surround the drops of the alkaline solution as they fall into the stomach contents, fading out again as the acids at first quickly neutralize it. Later the whole becomes a light rose-red, showing nearly complete saturation, but you should go on adding the

soda until each drop, as it falls in, no longer darkens perceptibly the mixture. Then neutralization is complete.

Suppose, for example, 8 c. c. to have been used in this titration, we multiply by 10 and obtain 80 as the total acidity.

Thus we have by these three titrations ascertained directly the percentage of free HCl, and the figure which represents the total acidity. Now, as the third titration (*c*) determines the sum total of all the acidities present, and the second titration (*b*) reveals the amount of all the acidities except the combined HCl, it is manifest that we have only to subtract the result of (*b*) from that of (*c*) to obtain the amount of the combined HCl.

Making this subtraction with the hypothetical figures above given, we have $80 - 60 = 20$. In this instance, it is proper to multiply the 20 by .00365 in order to obtain the actual percentage of combined HCl present. In the supposed case this would be $20 \times .00365 = .0730$.

This may seem complicated, and a little puzzling at first, but when one has conveniently at hand the reagents and the few appliances required, the actual processes of titration may be easily and quickly performed, while the calculations are simple enough.

The three steps may be thus briefly summarized:

(*a*) Find how many c. c. of the soda solution are required to neutralize the measured amount of the stomach contents with No. 1 as an indicator, and multiply this by 10, if 10 c. c. of the contents are being tested, or by 20, if only 5 c. c. are under examination. Set down the product.

(*b*). Find how many c. c. of the soda solution are needed to neutralize a like portion of the stomach contents with No. 2 and multiply as before to obtain the result for 100 c. c.

(*c*) Find how many c. c. of same solution are needed to neutralize an equal portion of the stomach contents with No. 3, and multiply as before. Subtract the result (*b*) from that of (*c*) and note the remainder. The result of (*a*) multiplied by .00365 gives the percentage of free HCl; the remainder of

(b) from (c) multiplied by the same fraction gives the percentage of combined HCl, and the figure obtained by (c) represents the total acidity.

Those of you who are inexperienced in making these tests will find it helpful to have at hand control solutions as follows: A solution of HCl, a few drops to the ounce, and a drop or two of the diamethyl, etc., neutralized by a solution of caustic soda till just the proper shade of yellowish red has developed; also a 1 per cent. solution of sodium carbonate containing a drop or two of the alizarin solution. Let an experienced chemist prepare these so that they shall show exactly the right tints.

Quantitative Test for Lactic Acid.—Numerous methods have been devised for determining the proportion of lactic acid present in the chyme. Most of these are rather complicated, and some of them so long and troublesome as to be quite impracticable for clinical use. Boas has devised one of the most reliable and delicate of these. It involves a very tedious series of processes, including distillation, and is never employed except for strictly scientific purposes. Boas has also made a large use of the following simpler method, which is sufficiently exact and not difficult:

Add to 10 c. c. of the filtrate a few drops of dilute sulphuric acid, heat over the flame, which coagulates the albumin, filter and evaporate over a water bath to the consistency of syrup, fill up to the original amount and evaporate again to a small volume. In this way the volatile fatty acids are removed and the residue contains only lactic acid. The residue must now be extracted with 200 c. c. of ether, the ether evaporated, and what remains diluted with water and titrated with phenolphthalein and one-tenth normal soda solution. Every c. c. of the one-tenth normal soda solution employed corresponds to 1.009 per cent. of lactic acid.

Quantitative Test for Fatty Acids.—The following method is employed by Leo: Determine the total acidity of the gastric contents. Then boil 10 c. c. till the vapor given off ceases to

show an acid reaction. Titrate the residue with one-tenth normal caustic-soda solution with phenolphthalein as an indicator. The decrease of acidity shows how much of the fatty



FIG. 24.—Yeast.—From a photograph, \times about 500. The preparation was made from a culture obtained from the contents of a dilated stomach.—*From Sidney Martin's "Diseases of the Stomach."*

acids were present. Adler advises that the proportion of HCl be estimated both before and after the boiling, so that allowance can be made for the amount of this acid lost in the boiling.

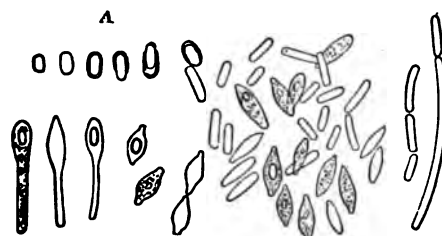


FIG. 25.—*Bacillus butyricus*, \times 1020. Simple rods are seen at the extreme right of the figure; also swollen and spindle-shaped spore-bearing bacilli. A, a spore-germinating.—*Prasnowski*.



FIG. 26.—*Sarcina ventriculi*. A, \times 600 seen in one plane; B, \times 650, diagrammatic, showing the appearance of cotton-bales.—*Flügge*.

Microscopic Examination of Stomach Contents.—Valuable information can also frequently be obtained by a microscopic examination of the stomach contents. In this way the presence of yeast fungi, sarcinae, various forms of mold, and numerous other micro-organisms may be detected, including especially the Boas-Oppler bacilli, which last are considered as being to some extent diagnostic of gastric carcinoma. The

character of the epithelial cells obtained from the stomach contents and wash water after lavage are also of importance diagnostically. When such cells are nearly all of the squamous type or of the ciliated columnar form, any mucus present, even though in large quantity, may usually be set down as having been swallowed and not secreted by the stomach itself. On the other hand, numerous non-ciliated columnar or cylindric epithelial cells, especially when they show evidences of fatty degeneration and stain imperfectly, indicate an inflammatory disease of the gastric mucous membrane itself. The discovery, microscopically, of numerous groups of proliferated or degenerated cells points to the existence of respectively a proliferative or an atrophic form of chronic gastritis.

Fragments obtained in the wash water in the case of suspected carcinoma may sometimes afford information of more or less value when examined under the microscope. Ewald, in his "Diseases of the Stomach," expresses doubt as to the possibility of recognizing in this way specific cancerous tissue, and adds, "this is certainly impossible with isolated epithelial cells."¹

Riegel² thinks it probable that characteristic findings may be discovered in the wash water microscopically in the later stages of carcinoma, but Stockton, the American editor of the English translation of his work, in commenting upon the foregoing, adds the following note:

"On the question of the possible early determination of the presence of carcinoma by examination of the fragments of the gastric mucosa recovered in the wash water, Hemmeter believes that he has occasionally been successful in making a diagnosis by this method. Most observers regard this criterion as absolutely valueless. Einhorn, in a recent article, suggests that the diagnosis of carcinoma of the stomach may be made in this way under specially favorable conditions if a direct invasion of the gland-substance by epithelial cells can be observed."

¹ "The Diseases of the Stomach." By Dr. C. A. Ewald, New York, 1894.

² Nothnagel's Practice, "Disease of the Stomach," Philadelphia, 1903.

LECTURE XI

THE URINE IN GASTRO-INTESTINAL DISEASE—URANALYSIS AN AID IN ESTIMATING THE SECRETION OF HCl.

Uranalysis Indispensable in Gastro-Intestinal Affections.—

It is highly essential in the management of all chronic diseases to make thorough analyses of the urine from time to time. It is especially important to do this in affections of the stomach and intestines, since here so much useful information may be thus gained which cannot be obtained in any other way. The digestive processes which take place below the stomach cannot be investigated with any certainty or satisfaction except through examinations of the feces and urine; and examinations of the latter, besides being more easily made than that of the former, are in some respects even more instructive for the expert in such work. As regards the tissue changes in the processes of metabolism, uranalysis is our chief source of knowledge, though blood examinations are always important in severe or doubtful cases of impaired digestion.

You may object that, besides requiring such a high degree of technical training in chemistry and in the use of the microscope as not all general practitioners of to-day possess, thorough analyses of the urine and gastric contents, to say nothing of chemic and microscopic examinations of the feces and blood counts, consume a great deal more time than patients are willing to pay for.

Better Fees Should be Paid for Analyses, etc.—It is doubtless to an extent true that patients object to paying for such work; but it is your duty as family physicians to assist in educating the laity in such matters. Most patients of moderate means will pay, without grumbling, handsome fees for no

more necessary surgical operations, and they should be taught to pay adequately for exceptional time and skill devoted to indispensable, complicated, and time-consuming procedures which are performed in the laboratory.

We physicians by our zeal in the cause of science and willingness to do certain kinds of work with little or no regard to a proper recompense cheapen our profession. Our surgical friends are right to insist upon a generous remuneration for their most valuable services; and the lawyers, too, are always far better paid than we are. When, therefore, you have trained yourselves (or been trained) to do first-class and most necessary work in the way of skilled examinations in the laboratory and at the bedside, you should next train your patients to pay for it properly.

Boas, in his book on "Diseases of the Stomach," has summarized the work of numerous German investigators concerning the relations between the urine and the gastric secretion, from which it appears that it is *almost* possible to learn from a careful study of the former when an excess or deficiency of HCl is being secreted.

Relation between Urinary Acidity and HCl Secretion.—

These investigations show that in health the urine is most highly acid before meals and least acid, or sometimes even alkaline, after meals at the height of digestion, especially after a large meal such as dinner. When, however, a deficiency of HCl is secreted, and still more when, owing to complete atrophy of the gastric glands or to any other cause there is a stoppage of secretion (achylia gastrica), the normal falling off in the acidity of the urine during digestion is lessened or fails altogether.

On the other hand, when an excess of HCl is secreted by the gastric glands the falling off in the acidity of the urine during digestion is increased and marked alkalinity is likely to appear instead. If there were no other causes than variations in the gastric secretion for fluctuations in the course of urinary acidity before and after meals, the matter would be very simple,

and we could ascertain from uranalyses at different times of the day the state of the HCl secretion with sufficient exactness for most clinical purposes.

But there are other factors in the problem which affect the result—other causes of variations in the urinary acidity which, so far, our most skilled physiologic chemists have not been able to reckon with or allow for with sufficient exactness, and, therefore, up to the present time, we cannot ascertain with any approach to certainty the state of gastric secretion by uranalysis. It seems probable, though, that this problem will yet be solved, and that chemists will one day be able so to exclude other disturbing causes of fluctuations in the urinary acidity that they can determine therefrom approximately how much HCl the stomach is secreting, or at least whether the secretion is excessive or deficient.

Meanwhile, in any case of suspected stomach trouble in which the introduction of a tube is impracticable, you should test the urinary acidity before breakfast and again two to three hours after dinner, and if you then find a pronounced variation from the normal decrease of acidity, and if this finding points in the same direction as the external examination with the help of the Benedict effervescence test described in Lecture IX., you may infer with probable certainty that the state of the HCl secretion is as indicated by that rough test.

Furthermore, in any case of unusual importance in which the stomach tube cannot be employed—whether the patient declines to swallow it, as some do, or any of the numerous contra-indications for its introduction are present (see Lecture VII.)—you may obtain additional confirmatory evidence as to the state of the HCl secretion by carrying out the not difficult method of determining the proportion of chlorides in the urine.

Importance of Estimating the Chlorides.—While the chlorides in the urine are derived from the food, and their amount generally bears a direct relation to the amount ingested, gastric activity does to a great extent influence the excretion of this important urinary solid. HCl, the physiologists teach us, is

formed by the parietal cells from the chlorides which the mucous membrane takes up from the blood, and the formation of acid ceases if chlorides be withheld from the food. According to Maly, lactic acid, which is present in the stomach, splits up the sodium chloride and forms free HCl. The base set free is excreted by the urine. It is thus evident that during gastric digestion, when the formation of HCl is going on, the amount of chlorides in the urine diminishes in direct proportion to the amount of acid formed. While it is manifestly impossible to establish the exact relation without an exact knowledge as to the amount of chlorides ingested with the food, there is, nevertheless, a general post-prandial curve which is of diagnostic significance. During digestion, the amount of chlorides in the urine gradually diminishes, to increase again when digestion is complete and absorption commences. In hyperacidity the diminution of chlorides in the urine is marked, and is generally in proportion to the degree of hyperacidity. On the other hand, in anacidity or gastric atrophy no such diminution is observed. Therefore, if you determine the chlorides in the urine voided immediately before and again one to two hours after a meal, you may obtain satisfactory information as to the probable presence of hyper- or hypo-acidity, provided, however, you exclude other conditions which produce fluctuations in the excretion of chlorides, such as vomiting and the formation of exudates. According to Hemmeter, if a small amount of chlorides is accompanied by an equivalent reduction in the amount of urea excreted, the indications are that the case is one of simple inanition, a benign stenosis; but if the reduction of the chlorides is associated with a relatively large amount of urea, malignant stenosis is probably present. I may here remark that in drawing inferences as to the normal or increased excretion of chlorides, you should always take into account the urea excretion. If the increase of chlorides is due to increased digestion of food, the urea will be proportionately increased, and vice versa.

The determination of chlorides is best accomplished by the

very accurate method devised by Volhard. The solutions required are: 1. A standard silver solution prepared by dissolving 29.075 grms. of silver nitrate in 1 liter of water. Each c. c. of this solution equals 10 milligrams of sodium chloride. 2. A saturated solution of ferric alum. 3. A standard solution of potassium sulphocyanid, so prepared that 25 c. c. of the solution equal 10 c. c. of the silver nitrate solution.

Having prepared these solutions yourselves, or obtained them from a reliable chemist, you can make the determination with considerable ease. Method: Take 10 c. c. of the urine, add 4 c. c. of nitric acid and 15 c. c. of the silver nitrate standard solution. Dilute the whole with water to 100 c. c. Filter. Take 80 c. c. of the filtrate, add 5 c. c. of the ferric alum solution and titrate with sulphocyanid solution until a permanent red color is imparted to the mixture. Divide the number of c. c. of sulphocyanid solution used by 2 and subtract the result from 15. The remainder represents the number of c. c. of silver nitrate solution required to precipitate the chloride in 10 c. c. of urine. As each c. c. of silver solution equals 10 mgms., the number of c. c. multiplied by 10 represents the number of mgms. in 10 c. c. of the urine, and this again multiplied by 10 gives the amount in 100, or the per cent. For example: Suppose 6 c. c. of the sulphocyanid solution were required to bring about the end-reaction, $6 \div 2 = 3$; $15 - 3 = 12$; $12 \times 10 = 120$ mgms.; $120 \times 10 = 1200$ mgms., or 1.2 grms. per 100 (1.2 per cent.).

If you have a centrifuge the speed of which can be regulated, an electric centrifuge is best, you may use Purdy's centrifugal method, which, as described by that author, is performed as follows: Fill the graduated tube to the 10 c. c. mark with the urine, add 15 drops of nitric acid and fill to the 15 c. c. mark with a standard solution of silver nitrate (3 i to 3 i). Invert the tubes several times, replace into the centrifuge, and revolve them at the rate of 1000 revolutions per minute for three minutes. The volume of the bulk of the precipitate represents the percentage.

LECTURE XII

THE URINE, CONTINUED—SIGNIFICANCE OF INDICANURIA, AND TESTS FOR IT

Partial Examinations of the Urine Better than None.—To examine the urine for albumin and sugar merely, as many do, is much better than not to examine it at all. Even to take the specific gravity and make the Heller's or the heat and nitric acid test for albumin may afford valuable information in the management of a case. But you should do a great deal more with the urine, as a rule, when the patient is chronically out of health. For a high specific gravity alone by no means proves the presence of sugar, nor a low specific gravity renal inadequacy, and albumin, transiently present with or without casts, does not necessarily signify Bright's disease. Nor does the absence of both albumin and casts at a single examination exclude the possibility of diseased kidneys. And the urine very often presents other abnormal conditions which indicate disease in other organs than the kidneys. These are trite truths for experts in physical diagnosis, but need to be emphasized for many others.

Unfortunately, the older teachings on this subject were deficient. A recent medical writer of more than ordinary prominence and ability, in very properly calling attention to the importance of more frequent analysis of the urine, names the following as the only points concerning which it is necessary in most cases to examine: "Quantity, color, clearness, odor, reaction, specific gravity, albumin, sugar, sediment." This list does not include indican, the degree of acidity, the total amount of solids excreted in twenty-four hours, or even the amount of uric acid, all of which are most important.

Indicanuria, High Acidity, etc.—In my laboratory, out of

many hundreds of urinary analyses made during the past year, fully one-half revealed an excess of indican. This indicanuria is most frequently a consequence of excessive putrefaction in the intestines, which usually indicates more or less auto-intoxication and many resulting nervous symptoms, often of a serious and distressing character. It has also been observed in unhealthy pleuritic exudation and in peritonitis with putrid pus (Von Jaksch), but such cases are very rare in comparison with those resulting from putrefaction of incompletely digested proteids in the bowels. Hochsinger has found that the urine of newborn children is free from indican, and that in healthy infants it occurs only in traces. According to the latter observer, "it becomes more abundant in intestinal disorders, and is always most so when these are attended by diarrhea." My own experience fully confirms this last observation of Hochsinger. The latter recorded also that "tuberculosis, whether affecting the intestinal tract or not, was always accompanied by profuse indicanuria."

The ether-sulphuric acid compounds generally, or aromatic sulphates, when present in the urine, have a significance similar to that of indican, and their percentage should be determined in stubborn or difficult cases, but the methods of determining them are rather complicated—scarcely practicable except in well-equipped laboratories.

In a considerable proportion of my cases there has been also an abnormally high total acidity. Patients with overacid urine are apt to be sufferers from intestinal indigestion, constipation, rheumatism, neuralgia, headaches, or insomnia, and often several of these ailments, as well as a variety of other nervous symptoms. Not till the excessively acid condition of the urine has been relieved by improving the digestion, by alkaline diuretics and an appropriate diet, including an abundance of pure water, have the patients made any substantial improvement in health.

The falling of the total amount of solids passed by the kidneys in twenty-four hours, below an average of 1000 grains

(65 grms.) in a person weighing 140 pounds or upwards, indicates a depression of the renal function. If repeated tests always show a markedly diminished excretion of solids, in spite of the institution of measures to increase it, there is reason to suspect beginning chronic interstitial nephritis, even though there are no decided symptoms and no albumin or casts. On the contrary, an increase in the solids when there has been no loss of weight from wasting, indicates an excessive intake of food, which you should correct.

Uric acid excess is one of the most common morbid conditions that may be shown by a thorough examination of the urine. Without going to the length that Haig does in attributing a very large proportion of chronic internal diseases to this one excrementitious product, it must be admitted that its presence in the system in unusually large amounts is always accompanied by decidedly unpleasant and often by distressing symptoms, which may be ultimately dangerous to life, but we now know that other associated metabolic products, such as the xanthin bases, are the real toxic agents.

A Quick Test for Indican.—There are many tests for indican, most of which are rather complicated to be serviceable to the busy general practitioner. By the following method, however, it is easy to decide almost instantly whether there is present any notable excess of indican:

Pour into a small test tube a dram (4 c. c.) of the strongest hydrochloric acid and add about 30 drops (2 c. c.) of the urine to be tested. Shake the mixture or stir with a glass rod. If there should be a decided excess of indican, a purplish blue or violet tint will appear almost immediately. If such a reaction does not occur promptly, add 1 drop of strong fuming nitric acid. If this should not develop one of the above-mentioned colors, there is no indicanuria; the sooner the purple color appears, the greater is the excess of indican.

Should you find an excess of indican by this simple qualitative test, it would be well to make a quantitative determination. This is important, not only because it furnishes information

regarding the degree of indicanuria, but enables you to judge from subsequent analyses of the degree of improvement brought about by treatment. The quantitative tests for indican described in the more elaborate text-books are entirely too complicated for ready application, but the method devised by Dr. A. Robin is both simple and accurate. As described by him in the *International Medical Magazine* (December, 1900), the test is performed as follows:

“Approximate Quantitative Test for Indican.—Prepare the following solutions: (1) Obermeyer’s reagent, which is made up of strong hydrochloric acid, C. P. and 2 grms. of ferric chloride for each 1000 c. c. of the acid; (2) a 25 per cent. solution of lead acetate; (3) a solution of potassium chlorate containing 1 per cent. of available Cl or 34.6 grms. of the salt per liter.

“To 10 c. c. of the urine add 1 c. c. of the lead acetate solution and filter through a double filter. Put 5 c. c. of the filtrate into a test tube, add 5 c. c. of Obermeyer’s reagent and 2 c. c. of chloroform and invert the test tube about ten times, or until the color of the chloroform ceases to become more intense. The latter will assume a violet or blue color, according to the amount of indican present. Now add from a dropper the potassium chlorate solution, drop by drop, shaking the mixture after each addition until the blue color of the chloroform disappears. The potassium chlorate liberates chlorine in the presence of a strong mineral acid and oxidizes the indigo formed by the addition of Obermeyer’s reagent. If the amount of indican is normal, one or two drops will cause discoloration. In making your memoranda, mark down ‘discolored by x drops of K ClO₃ solution.’ This will give you exact information as to the increase or decrease of indican in a given case.

“The advantages of this method over similar ones are: (1) A special oxidizer is used for converting the indican into indigo. (2) There is no danger of carrying the oxidation beyond the point of the appearance of indigo, as is the case when the

chlorine solutions are used, since ferric chloride does not oxidize the indigo formed. (3) By employing potassium chlorate instead of the chlorides, we have a permanent solution of definite strength which is easily prepared. (4) The final oxidation of the indigo introduces a fixed point far more accurate than the intensity of the coloration of the chloroform upon which most of the other methods depend. (5) The determination can be made in a few minutes, only small quantities of urine being required."

Test for the Total Amount of Solids.—A rough and hasty, but sufficiently accurate way of estimating the total amount of solids excreted by the kidneys in twenty-four hours is as follows:

Have all the urine passed from, say 8 A. M. one day to 7 A. M. the next saved, measured, and the number of ounces noted. Then multiply the number of ounces by the last two figures that represent the specific gravity of a sample out of the entire collected urine and add to the product one-tenth of itself. For example, if 50 ounces of urine were passed in the aggregate during one day and night and the specific gravity of a sample taken out of the collection were 1020, this would be the calculation:

$50 \times 20 = 1000$. Then, adding one-tenth of $1000 = 100$ would make 1100, representing approximately the number of grains of solid matters excreted. This would be normal for a person weighing from 130 to 140 pounds. Those weighing less or more should excrete relatively less or more solids. After middle age the ratio of excretion is usually found somewhat diminished.

LECTURE XIII

THE URINE, CONCLUDED—TESTS FOR URIC ACID, UREA, AND THE ACIDITIES—LABORATORY OUTFIT

Tests for Uric Acid.—As to uric acid, a copious deposit of red sand in the vessel in which urine has stood for three or four hours only, points usually to excessive excretion of this substance, though a very decided acidity of the urine from other causes, such as abundant fermentation in the gastrointestinal tract, or a marked scantiness of the urine, may lead to such a large precipitation of uric acid even when only a moderate proportion of it is being excreted. The lower powers of the microscope will also reveal a great number of uric acid crystals under the same conditions.

A quantitative test for uric acid which is scientifically accurate and delicate, and at the same time rapid and simple, has yet to be discovered.

The following method of Heintz, which gives fairly reliable results for clinical purposes, is the easiest and simplest of all and yet even this involves a long delay in reaching the result:

Take 200 c. c. of urine, and add to it 10 c. c. of strong HCl. Let it stand for twenty-four hours (better forty-eight hours) in a cool room. Collect the precipitated uric acid crystals on a previously weighed filter, and wash with cold distilled water. Dry the filter and uric acid crystals in a desiccator (or it will dry in a few hours in any warm place), and weigh. By subtracting the weight of the filter, the result will be the weight of the uric acid in 200 c. c. of urine. If albumin be present,

it should first be removed and the urine should always be filtered before applying the test, otherwise subsequent filtration is very difficult.

Folin-Hopkins Method of Determining the Amount of Uric Acid.—As it sometimes happens that not all the uric acid is precipitated in an acid solution, a more reliable test is that devised by Hopkins and modified by Folin. It is carried out as follows: To 100 c. c. of urine are added 10 grms. of ammonium acetate, and ammonia is added, drop by drop, until a slight ammoniacal odor is perceived. The mixture is set aside for three hours and then filtered. The sediment is washed six to eight times with a saturated solution of ammonium carbonate and then transferred by means of hot distilled water from a spritz-bottle into a beaker. Then 15 c. c. of concentrated sulphuric acid (sp. gr. 1.845) are added and the whole titrated with one-twentieth potassium permanganate standard solution until the first appearance of pink which diffuses throughout the entire liquid and persists for a few seconds. Each c. c. of the permanganate solution used equals 3.648 milligrams of uric acid, the total product representing the amount of uric acid in 100 c. c. of urine.

Urea.—This is the normal end product of nitrogenous metabolism and in amount it should be about one-half that of the total solids. Various gastro-intestinal affections and also the diet vary its rate of excretion. The determination of urea is best accomplished by means of Doremus' modified ureometer. Ten c. c. of a saturated solution of sodium hydrate are put in the bulb-end of the tube and 1 c. c. of bromine added. Care should be exercised in taking up the bromine, as it is extremely irritating and corrosive. When the reaction between the bromine and sodium hydrate is complete, as may be judged from the entire disappearance of the former, enough of water is added to fill the closed end of the tube up to a little above the bend. When the formation of gas bubbles has all subsided the apparatus is freed from the latter by inclining it, and the side tube is filled with urine to the zero mark. One

c. c. of urine is then carefully discharged into the hypobromite solution and the apparatus set aside until complete evolution of gas has occurred. The volume of gas in the closed end of the ureometer indicates the percentage of urea.

Test for the Total Acidity.—As to determining the degree of acidity or amount of total acidity in urine, it is a markedly simple and rapid procedure when one knows how, and it requires in the way of apparatus merely an inexpensive burette, or long glass tube graduated to tenths or fifths of a cubic centimeter, a graduated cubic centimeter measure and a small glass cup or beaker holding two to four ounces. There are required also a one-tenth normal (decinormal) solution of caustic soda and a one per cent. alcoholic solution of phenolphthalein, both to be obtained of most wholesale chemists. Partly fill the burette with the soda solution and note down the reading or exact figure opposite the upper limit of the solution, and for this purpose it is the rule to consider the bottom rather than the top of the curve which liquid always assumes in a tube at its upper end. Measure out and place in the glass receptacle 10 c. c. of the urine and add to it one or two drops of the phenolphthalein. Then add, drop by drop, the soda solution from the burette until the red color thus produced no longer disappears upon shaking. A uniform pale red color will now tinge the entire 10 c. c. of urine, indicating that the acidity of the latter is about neutralized. Then read the burette again and subtract the figure from that first obtained, multiply the remainder by 10, and the product is the total acidity. In the absence of a burette with its lower end so arranged as to allow the escape of the contents drop by drop, one may get on quite well by first placing a measured amount of the soda solution in any receptacle, and then taking up in an ordinary rubber-topped pipette and dropping out of this into the measured urine so much of the soda solution as is necessary to neutralize the former completely in the same manner described above. When this has been accomplished, the remaining test solution will need to be measured again and the difference between the two

measurements multiplied by 10 will be the figure representing the total acidity.

For example, suppose that to begin with, there was in the burette or other receptacle 20.2 c. c. of the soda solution, and after the titration (as the whole process is called) there are 16.1 c. c. left. Subtracting, it is found that 4.1 c. c. of the solution have been used. Multiplying these figures by 10 (since 10 c. c. of urine were used and all such calculations are upon the basis of 100 cubic centimeters) we have 41 as the total acidity.

Important as this test is to gauge the degree of acidity of the system generally and prevent the blood from becoming too feebly alkaline, it has been so little practiced that there is not yet by any means an agreement among different observers as to the normal acidity of the urine; but, judging by my own by no means small experience, it is safe to put it at between 20 and 30. A wide departure from these limits in either direction threatens an impairment of the health if long continued, when it does not indicate an impairment already established.

Freund and Topfer's Test for the Urinary Acidities.—Freund and Töpfer suggest the following method, which furnishes more complete data concerning the acidity of the urine: To 10 c. c. of the urine add 2 to 4 drops of a 1 per cent. solution of alizarin. If the resulting color is pure yellow, free acids are present; if deep violet, combined acid salts. If none of these colors appear, there are present acid salts and alkaline salts of the type of disodicphosphate. The amount of one-tenth normal HCl standard solution required to produce a pure yellow color represents the alkaline salts, while the amount of one-tenth normal sodium hydrate required to cause a deep violet tint represents the acid salts.

Biliary Pigments and Acids.—Whenever there is obstruction to the flow of the bile into the bowel there will be found more or less of the bile pigments and acids in the urine. It is said they may be recognized in the urine even before the ap-

pearance of jaundice or the slightest change in the conjunctivæ. Since disorders of the stomach and liver go hand in hand so very frequently, it is highly important to test the urine for such substances in all obscure or doubtful cases. The bile pigments may be revealed by the familiar Gmelin's test described in all the books, and there are many others, but one of the simplest of the good ones is Ultzmann's, which is thus carried out: Mix with 10 c. c. of the urine 3 or 4 c. c. of concentrated caustic potash solution and acidify with HCl. When the bile pigments are present the urine will then turn a beautiful green color which is very striking.

Professor Tyson many years ago suggested a very accurate method of extracting the bile acids from urine previous to carrying out the Pettenkoffer test, which latter is well known, but rather tedious.

A very simple test is that recommended by Oliver, which depends upon the fact that peptones are precipitated in the duodenum or out of any acid solution by the bile acids. It is thus carried out: Prepare first an acid solution of peptone by mixing 30 grains of Savary and Moore's peptone, 4 grains of salicylic acid, 30 minims of acetic acid, and enough distilled water to make 8 ounces. Filter till a clear filtrate is obtained. To 60 minims of this filtered solution add 20 minims of urine which must be perfectly clear, reduced by dilution with distilled water to a specific gravity of 1008 and, if not already normally acid, be rendered so by acidifying it. No immediate reaction occurs when the urine does not contain a proportion of the bile salts in excess of the normal, though shortly a slight milkiness will appear. On the other hand, when there is an excess of the bile salts present, a distinct turbidity immediately appears and gradually becomes more intense, the opacity developed being in proportion to the amount of the bile acids in the urine.

An excess of bile acids in the urine points to some important hepatic derangement. They may occur not only as a result of obstruction of the bile ducts, but also in consequence of

congestion or cirrhosis of the liver and in various diseased conditions, including carcinoma or other tumors of the liver, and in severe bilious attacks. The combination of hepatic cirrhosis or congestion with constipation will often produce an excess of the bile acids in the urine. Thus something may frequently be learned by testing for these acids; yet, ordinarily, testing for the bile pigments will determine with sufficient accuracy the presence of bile in the urine.

Acetone and Diacetic Acid.—Not only in diabetes and in certain fevers, but also in the opposite conditions of starvation and an excessive meat diet can acetone be found in the urine. It is also frequently present in carcinoma and sometimes in other cachectic conditions such as may arise in extensive dilatation of the stomach. When, therefore, you desire to exhaust every means of reaching an approximately accurate diagnosis in a doubtful case you should test for acetone; and in order not to be misled by the possible presence of diacetic acid, which by decomposition often forms acetone, you should first test for diacetic acid by the v. Jaksch method as follows: Add to the urine a concentrated solution of perchloride of iron cautiously, drop by drop. If a phosphatic precipitate falls, filter this off and add a few drops of the iron solution. If now a red color appears, boil a portion of the urine, which by the way should have been freshly voided, and to another portion add a few drops of sulphuric acid and shake with ether. If the boiled urine shows no reaction with the iron solution and the ethereal extract develops a claret-red color with that solution, diacetic acid is probably present and should be removed from the sample to be tested for acetone, though most works on uranalysis make no mention of this important fact. Its removal, according to Charles F. Martin,¹ is effected by rendering the urine faintly alkaline and then shaking it carefully in a separator funnel with ether. The latter should be free from both alcohol and acetone. The removed ether must then be shaken with water, which takes up the acetone, and this watery

¹ Wood's "Reference Handbook," Revised Ed. vol. i. p. 66.

solution of the purified acetone may then be tested for the latter.

Lieber's Iodoform Test for Acetone, is the one generally recommended, though there are numerous other substances often in the urine which produce a similar reaction, and when accuracy is desired it is best to distill the urine and test the distillate. The test is then carried out as follows: Dissolve 20 grains of potassium iodide in a dram of liquor potassæ, and boil. The urine is then floated on the surface of the liquid in a test tube. At the point of contact a precipitation of phosphates occurs. Even when a distillate of the urine is used for the test, the presence of lactic acid or ethyl alcohol in it may produce similar reactions.

Diacetic acid is never present in urine in the absence of acetone, and its presence with the latter signifies, according to most authorities, a serious condition in the case of adults, usually portending in diabetics the approach of coma. In children it is a frequent accompaniment of fever and not necessarily important.

Laboratory Outfit.—Dr. Robin, in an article written at my request for the *International Medical Magazine*, gave the following useful advice upon this point: "Have your bottles properly labeled and arranged on shelves, so as to be easily accessible. Make up your reagents in small quantities (four to eight ounces), so as to have them fresh, for most watery solutions of chemicals deteriorate upon keeping. Have your table spacious, in order that you may be able to carry on several tests at the same time and thus save much of your valuable time. Too much stress cannot be laid on this. In a small, crowded back office with a few heterogeneous bottles and dirty test tubes, with just enough standing room near the sink, the incentive to do good and thorough work is very slight, indeed. It will pay you to invest in a little room especially designed for laboratory work, or, if the latter is impossible, have your back office so arranged as to have a separate corner for this purpose. Much valuable wall space is often taken up

by bookcases filled with antiquated medical volumes or other useless furniture. Another important precaution: Clean your apparatus as soon as the work is finished. The time necessary for cleaning will increase in direct proportion to the time during which the test tubes and other apparatus are permitted to remain with their last contents undergoing all kinds of transformations from a muddy liquid to various forms of precipitates closely adhering to the walls of the apparatus."

All the standard solutions can be obtained from reliable dealers in chemicals, and with the solutions and necessary apparatus on hand, provided you have had the requisite training and practice, the methods of analysis can be carried out without any great loss of time. Should you, however, be too busy with a large practice to make these tests it will pay you to have it done for you either by an assistant in your own laboratory, or in the more serious cases by an expert. Dr. Robin in the same article added the following important suggestions:

"For the purpose of collecting the urine and determining the amount, a graduated bottle is the only suitable vessel. The ordinary way of collecting the urine in a night-pot introduces a considerable error in the specific gravity by the constant evaporation to which the urine is subjected in an open or imperfectly closed vessel. Any ordinary bottle of a capacity of 2000 c. c. (one-half gallon) can easily be graduated by means of a long strip of paper pasted on the outside, with marks corresponding to divisions of 500 c. c. each. If the night pot is the only container available, the patient should be instructed to deposit a layer of vaselin on the under surface of the lid where it comes in contact with the upper edge of the pot. The amount can be measured either by means of a glass (usually of eight ounces' capacity) or a beer bottle (which usually contains one pint). In the case of the busy man who is away from home during the day, he can be instructed to carry about him two flat bottles (eight ounces each) into which he urinates as occasion demands and upon reaching his

house he empties them into the general container. Whatever vessel is used, it should be scrupulously cleansed and have added to it enough formalin to make a proportion of one part of formalin to 2000 or 1000 parts of urine. When formalin in such small amounts is added to the urine after it has been allowed to become contaminated by bacteria, the latter are not all killed, and the urine will reach you in a putrid state. With regard to insurance examinations, a twenty-four-hours' sample is out of the question, nor is it absolutely necessary, since the detection of albumin, sugar, or other gross abnormalities is the only requisite. For the latter purpose a sample obtained after meals will be more likely to show these abnormal constituents than one collected upon rising."

LECTURE XIV

THE EXAMINATION OF FECES—THE BLOOD IN GASTRO-INTESTINAL DISEASES

WERE it not for the offensive odor of the feces, the examination of them by the general practitioner would probably be as common as that of urine. But neither excretion is studied as much as it should be. The data which may be obtained from an examination of feces are as important from a diagnostic standpoint as those obtained from an uranalysis. The feces represent in health the total of whatever material passes unabsorbed through the gastro-intestinal tract. In disease, it contains admixtures of morbid material, the presence of which may of itself often be sufficient to establish a positive diagnosis of either some gastro-intestinal derangement or actual disease.

In view of the valuable information that may be gained in this way, it would seem incumbent on the physician to overcome the natural repugnance to this malodorous excretion and resort to an examination of the feces whenever indicated by reason of obscure gastro-intestinal symptoms. Let me here remind you that the fecal odor may be successfully masked by covering the feces with a thin layer of ether.

The Feces in Health.—In health the contents of the small intestines are liquid. As they reach the large intestine they are propelled with less rapidity, and in their comparatively slow course through the descending colon and sigmoid flexure lose a considerable amount of water, which is absorbed. In consequence, the feces assume a semisolid consistency and are molded. Within certain limits, the consistency and form of the feces will vary even in health, the variation depending on

the amount and character of the food and the degree of peristalsis. It is well to note in this connection that the ingestion of even large amounts of water does not influence much the consistency of the fecal mass, though it does somewhat, and a deficiency of ingested fluids may be one cause of constipation. The quantity passed in twenty-four hours is about 100-200 grms. The fecal odor is due to indol and skatol, substances which are the result of bacterial action on the undigested organic matter. The color is a yellowish-brown and is produced by bilirubin, which is the coloring matter derived from altered bile. The reaction is usually alkaline, but may be acid.

The Macroscopic Examination.—The fecal discharges may be examined separately, or the twenty-four hours' excretion collected in a closed vessel to which some formalin has been added. The formalin, of course, should be omitted when a bacteriologic investigation of the feces is intended.

The feces, if semisolid, should be diluted with water and stirred into a uniform fluid mass. In this should be noted the color, reaction, and the admixture of unusual elements.

The Color.—A dark pitch-like appearance is produced by the action of the gastric juice on mucus, blood, and epithelium. This appearance will sometimes characterize the feces during starvation or fasting,—always when there has been hemorrhage from the stomach or upper intestine and the altered blood appears in the stools. A yellowish-gray color is due to mucus when in large quantity. The presence of a yellow-colored serum indicates a large amount of pus. A straw-colored serum occurs in cholera. A blood-like color is produced by huckleberries, while a greenish or blackish color is due to the sulphides of mercury or bismuth. A blackish-gray color is produced by the sulphide of iron, the sulphides of these metals being formed by the action of hydrogen sulphide present in the intestines. A yellow color is produced by rhubarb, senna, and santalin. After the administration of methylene blue, a bluish-green color will appear on the ex-

posure of the feces. A green color may also be produced by certain chromogenic bacteria. A clay color is due to excess of fat (undigested) or absence of bilirubin. The presence of unaltered bile-pigment is always an indication of disease.

The reaction of the feces is alkaline in typhoid fever and in the "clayey" stools of dyspepsia in children. It is acid in acute enteritis. The reaction may be determined by means of litmus paper.

By "unusual elements" we mean foreign bodies which are not expected to be present in normal feces—pieces of tissue, shreds of mucus, intestinal parasites, and gall stones.

Fecal Segregators.—In order that you may be able to detect the presence of abnormal solid constituents with greater facility, you should separate the solid particles by means of washing. For this purpose Boas devised an apparatus which consists of a spherical vessel, the upper hemisphere being fastened to the lower by screws. Each of the hemispheres contains a fine sieve which is placed horizontally. The specimen of feces is placed on the lower sieve; the vessel hermetically covered and the top of the vessel connected with the faucet. The water in passing from the upper sieve forms a fine spray which strikes the feces and washes them. After 15 to 20 minutes' washing the solid particles of the feces remain on the lower sieve.

Spivak devised a fecal segregator, which is very simple and can be readily constructed from a tin box. It consists of a bucket on a long wire handle and a glass cylinder about 2 to 3 inches in diameter. The bottom and cover of the bucket are made of fine wire mesh, and the bucket is of such size as to fit snugly into the cylinder. (See illustration.) The specimen is placed in the bucket, the cover screwed on, and the whole is lowered into the cylinder nearly full of water. By imparting to the bucket a churning motion by means of the wire handle, the whole volume of water in the cylinder is made to pass through the bucket and wash the specimen. Five minutes' time, he claims, is sufficient.

The specimen, having been washed either in Boas' or Spivak's apparatus, should be placed in a basin or bowl of clean water and carefully scrutinized, being stirred meanwhile with a stick or glass rod. In this way, any abnormal con-

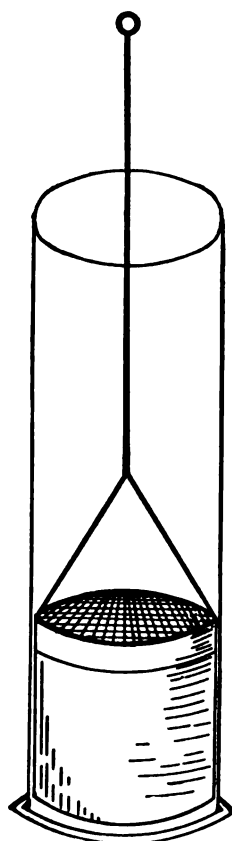


FIG. 27.—Spivak's fecal segregator.

stituents, such as hepatic or renal calculi, may be separated from the rest and picked out for further examination.

Various Foreign Substances to be Looked For.—Even in normal feces berries, fragments of potatoes and apples, and shreds of fibrous tissue may be present. After the ingestion

of oranges, the pulp and cells may be present, and the latter have been frequently mistaken for parasites, to which they bear some resemblance.

In intestinal catarrh the feces may contain epithelium and cylindric shreds or membranous pieces or strings of mucous membrane.

Gall stones are frequently present in the stools of patients suffering from hepatic colic. They should be looked for in every case of that affection.

Intestinal parasites are frequently present, and search should be made for them in every case in which their presence is suspected.

The Microscopic Examination of Feces.—Much more valuable information may be obtained from a careful microscopic examination of feces. Indeed, the presence of undigested muscle fibers, fat-crystals, starch-granules, epithelial cells, pus cells, and animal and vegetable parasites and other abnormal elements can be detected in no other way. Regarding animal parasites, it must be remembered that adult intestinal worms may be absent from the feces, and their presence can then only be discovered by finding the eggs.

In making the microscopic examination, an oil-immersion lens is unnecessary unless a bacteriologic investigation is undertaken.

To obtain a satisfactory sample for microscopic examination the method suggested by Hertz may be followed.

A portion of the feces is rubbed up in a mortar with a 5 per cent. solution of carbolic acid, and the mixture centrifuged. The fecal matter soon forms into a number of distinct layers. The uppermost is composed of bacteria; the next of undigested cellulose; the next of striated muscle fibers; the remainder of a number of small layers, containing round cells, clostridia, starch, etc. By means of a pipette a portion of any one of the layers may be taken up, a drop placed on a slide and examined.

The specimen thus obtained is examined unstained, and any

abnormalities noted. A drop of Lugol's solution is then allowed to flow under the cover glass. The iodine will stain the starch blue and other tissue elements yellow. If a bacterial examination be desired, a slide should be prepared from the upper layer, dried, fixed, stained with the appropriate stain, and examined with the oil-immersion lens. Unless some other is indicated, alkaline methylene blue will form a satisfactory all-around stain.

The following elements may be observed in feces:

1. *Vegetable cells.* Their presence is of no special significance. Some of them, however, may be mistaken by the inexperienced for parasites, and on that account they should be carefully scrutinized. The presence of a large quantity of starch-granules indicates that, besides deficient starch conversion in the stomach, the intestinal digestion has been unequal to the task of supplementing the work.

2. *Muscle fibers.* A certain amount of much-altered muscle fiber is present in normal feces; an excess, especially if the fibers are well striated, is indicative of lack of peptogenic power on the part of either the stomach or other digestive juices. Here the amount of meat ingested should be taken into consideration. This applies also to connective tissue, the excess of which, while the patient is eating only a moderate amount of meat, indicates digestive disturbances.

3. *Fat.* Normally, fat occurs in the form of needle-shaped crystals of fatty acids or polygonal glassy lumps. When the crystals are abundant, it is an indication of lack of fat absorption. The nature of the needles may be readily recognized by adding sulphuric acid and then warming. If the crystals are derived from fat, oil drops will form.

4. *Undigested milk curds* in either children or adults indicate digestive disturbance. The curds are recognized by their solubility in a 5 per cent. solution of HCl and precipitation by acetic acid.

5. *Epithelium.* A small number of epithelial cells is always found in normal feces. Squamous epithelium is derived from

the anus; columnar or cylindric epithelium from the intestinal mucosa. The cells, as a rule, undergo mucous degeneration and appear as small, non-nucleated, homogeneous, and somewhat glossy spindle-shaped bodies. When epithelial cells occur in large numbers it is an indication of intestinal catarrh.

6. *Red blood cells.* These are rarely found in health. Their presence in considerable number indicates hemorrhage, and most frequently ulceration somewhere in the tract. In intestinal hemorrhage, the red blood corpuscles undergo decomposition, and their presence may be ascertained by Teichmann's hematin test, which is performed as follows: A drop of the feces is placed on the slide, a few crystals of either sodium chloride or potassium iodide added, and the whole allowed to evaporate. When this is dry, a cover glass is placed over the preparation, and a drop of glacial acetic acid run under the cover glass. The slide is then kept over a flame until bubbles arise in the liquid. The preparation is cooled and examined under the microscope with the highest power. Typical crystals of hematin will be readily seen if blood be present. In order to familiarize yourselves with the appearance of hematin crystals, it will be well to perform the test on a minute particle of dried blood dissolved in a little water. (See Lecture LVIII. for other tests for minute quantities of blood.)

7. *Leucocytes*, when present in large numbers, indicate sup-puration somewhere in the gastro-intestinal tract.

8. *Animal parasites.* The amebæ, sporozoa, infusoria, and the ova of intestinal worms require for their recognition skill and experience. A brief description of the more important of these will be found in Lecture LXXIX. on Bacteria and the Animal Parasites. You are referred to the text-books on pathology for more exhaustive accounts of them.

9. *Vegetable parasites.* It is not expected that the general practitioner will have the time, skill, or equipment to make cultures from feces for the purpose of identifying the several specific micro-organisms, as the *B. typhosus*, *B. cholerae*, *B. dysenteriae*, and others. Yet, a mere microscopic examination



FIG. 28.—1. A, G, *aspergillus glaucus*; M, M, *mucor mucedo*; O, L, *oidium lactis*; S, C, *saccharomyces cerevisiae*. 2. S, P, *Staphylococcus pyogenes*; G, *gonococcus*; M, T, *micrococcus tetragenes*; D, P, *diplococcus pneumoniae*. 3. S, P, *Streptococcus pyogenes*; S, F, *sarcina flava*; B, T, *bacillus typhosus*; B, A, L, *bacillus acidilactici*. 4. B, S, *bacillus subtilis*; B, C, *bacillus coli communis*; B, A, *bacillus anthracis*; B, T, *bacillus tuberculosis*. 5. V, C, *vibrio cholerae*; B, T, *bacillus tetani*; B, D, *bacillus diphtheriae*; S, S, *spirillum serpens*. 6. Spiroch, *spirochete*; Sp., *spirilli from nasal mucus*; A, B, *actinomyces bovis*; S, F, P, *spirillum of Finkler and Prior*.

of stained specimens is of little value since bacteria cannot, as a rule, be identified by their morphology alone. In the accompanying illustration are shown the more important pathogenic micro-organisms, and it may be clearly seen that while we are always able to distinguish by shape and form cocci from bacilli, or the latter from spirilli, we are unable to differ-

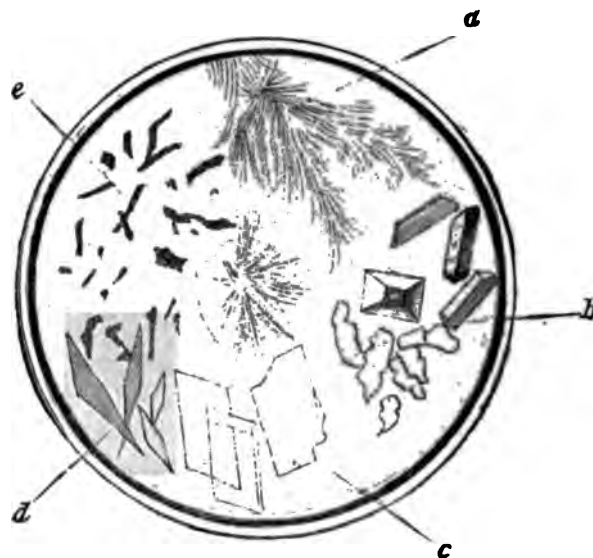


FIG. 29.—*a*, tufts of fat needles ("arranged in tufts"). *b*, crystals of ammonio-magnesium phosphates (triple phosphates) on the right hand; calcium oxalate on the left; underneath, rudimentary forms. *c*, cholesterolin-plates. *d*, Charcot-Leyden crystals. *e*, particles of animal charcoal (given for the purpose of fixing the limits of the feces). (From "Klinik der Verdauungskrankheiten," von Prof. Dr. C. A. Ewald.)

entiate the pathogenic from the saprophytic micro-organisms of the same group without further study by means of culture and even animal experiments.

There is, however, one exception, the tubercle bacillus. Owing to the characteristic staining reaction of this micro-organism, its presence may be detected in the feces by mere microscopic examination of a properly stained specimen. In examining the feces for tubercle bacilli it is preferable to select particles of mucus, as they are more likely to contain the bacilli.

It has been suggested to produce constipation by the administration of opiates, and then select for examination whatever slimy particles adhere to the outside of the fecal mass. This suggestion is based on the assumption that the hard fecal mass, in passing through the bowels, will carry from the tubercular ulcer whatever particles may become detached. It is to be noted that the examination for tubercle bacilli in the feces, in

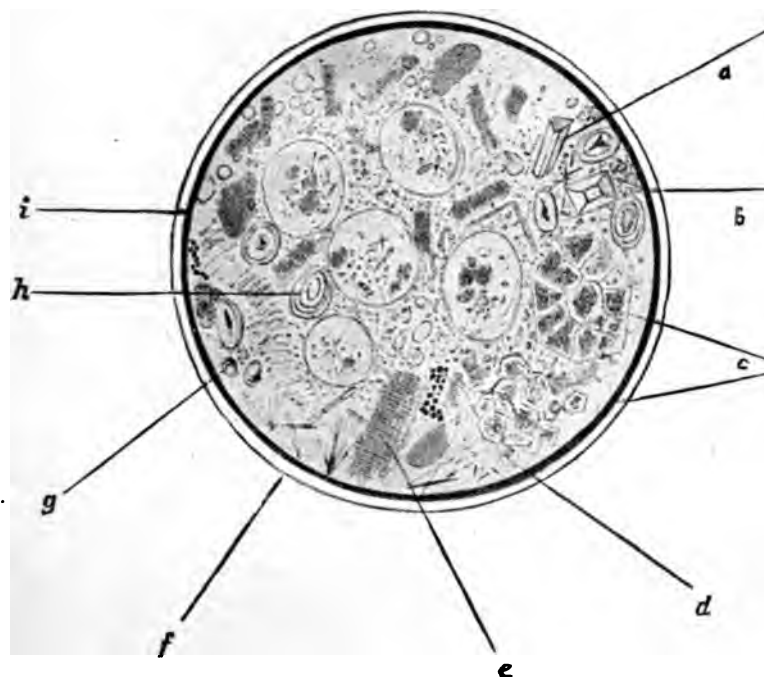


FIG. 30.—Stool in chronic colitis. *a*, triple phosphates. *b*, cocci and bacteria. *c*, vegetable cells (beans?). *d*, clostridium butyricum. *e*, muscle-fibers. *f*, needles of fatty acids. *g*, spiral vessel from a plant. *h*, starch-granules. *i*, disintegrated remains of muscle-fibers. At the center are the bright, highly refractive drops of mucus. (From "Klinik der Verdauungskrankheiten," von Prof. Dr. C. A. Ewald.)

cases of intestinal tuberculosis, is often disappointing. It is advisable to make several preparations, and at frequent intervals, in case of negative results. The method of preparation and staining is the same as in the case of sputum.

10. *Detritus* of varying composition and forms is derived from the food and waste products, and is of no significance.

11. *Crystals*. Crystals of cholesterin, oxalates, and other



FIG. 31.—*a*, crystals of bismuth sulphid. *b*, fat-droplets consisting of neutral fat (glistening brightly)? *c*, zooglea masses, containing diplococci, tetracocci, and bacilli. *d*, hyphomycetes. *e*, yeast-cells. *f*, spirals of vegetable vessels. (From "Klinik der Verdauungskrankheiten," von Prof. Dr. C. A. Ewald.)

organic salts of lime and triple phosphates occur in feces and are of no special significance.

Illustrations of Microscopic Findings in Feces.—The figures on pp. 170-172 illustrate the exact appearance under the microscope, of slides prepared from feces. While the majority of the things represented in them are of little diagnostic importance, it is well to be able to recognize them and differentiate them from more significant objects.

The last of these three photomicrographs represents numerous objects of interest, and some of decided diagnostic significance.

THE BLOOD IN GASTRO-INTESTINAL DISEASES

A large amount of study has been devoted to the condition of the blood in most of the diseases that affect mankind—the more important affections of the alimentary tract especially. Scores of investigators in various parts of the world have sought to find in blood changes points to help in establishing the diagnosis of ulcer and of carcinoma of the stomach particularly, and frequently the claim has been made that results of decisive value in this direction have been achieved. But later the reliability of such discoveries has been disputed and usually disproved. Eventually more useful results will likely follow from this line of research.

Blood Examinations Not Conclusive in Stomach Cases.—Without entering here into any extended account of the controversies upon this subject, it is enough to assure you that up to the present time even the most careful and painstaking examinations of the blood as to the number and character of its red cells, white cells, hemoglobin, and other constituents, of the bacteria and parasites in it, and even determinations of its specific gravity and alkalinity, have not afforded us much trustworthy assistance in reaching a diagnosis in doubtful gastro-intestinal cases.

Blood examinations can scarcely be expected to decide positively the diagnosis in any case in which a serious stomach disease could be suspected, though in a few intestinal diseases and possibly some painful gastric conditions which might be confounded with lead colic, a blood examination may often help clear up the doubt. I do not mean, however, to disparage the importance of the vast amount of research done in hematology. It has been most fruitful of good results in determining the diagnosis of typhoid fever, malaria, and various other diseases, and has added much to our knowledge of the

deteriorating effect of most gastro-intestinal diseases upon the blood.

Interesting observations, too, have been made by Henry¹ of Philadelphia concerning the state of the blood in gastric cancer. He has shown that in the latter disease the red corpuscles never fall below 1,500,000, while in every fatal case of pernicious anæmia they will be found—at the last—under 1,000,000 per cubic millimeter. He sums up the results of his investigations in this field by stating that “the diminution in the number of red blood cells in carcinoma of the stomach does not keep pace with the cachexia; in pernicious anæmia the cachexia does not keep pace with the oligocythæmia.”

These are very important observations, and may sometimes help you to decide in an obscure case, yet, manifestly the finding of 1,500,000 red cells in the blood of a weak, cachectic, and emaciated patient could scarcely be decisive.

In suspected pernicious anæmia dependent upon gastric atrophy, there would be an absence of free HCl and might be gastric pain independent of eating as in cancer, and the fact that at the last the number of red blood cells might in such a case fall 500,000 lower than they could in cancer, would hardly establish the diagnosis—at least not long before the autopsy, which would afford much more conclusive evidence. In any such doubtful case, the complete absence of the gastric ferments would make strongly for the diagnosis of anæmia from atrophy, while the presence of large amounts of mucus with much decomposing food remains as well as the Boas-Oppler bacilli and a decided percentage of lactic acid, would more likely indicate cancer, and such findings as these would be more decisive than even considerable differences in the proportion of erythrocytes in the blood, or the always difficultly determinable degree of cachexia.

But, though blood counts and hemoglobin estimations can rarely settle a doubtful diagnosis where a digestive trouble is involved, they can help much in determining the extent to

¹ “Archiv. d. Verdauungskrankh.,” vol. iv. Heft I.

which such troubles have lowered the health of your patients. They can also afford valuable evidence of the progress the latter are making toward recovery.

The most frequent cause of persistent anæmia and chlorosis is believed to be found in autotoxæmia, or auto-intoxication from various diseases of the digestive system. Cancer and ulceration often add hemorrhage as a further direct cause of anæmia, but these are infrequent as compared with the displacements, dilatations, and catarrhal inflammations which lead to imperfect digestion, stagnation, constipation, and other chronic causes of blood impoverishment.

Frequent blood counts and estimations of the hemoglobin should, therefore, not be neglected in managing the important diseases of the digestive system.

Below are brief descriptions of some of the simplest and most satisfactory methods of making the more necessary examinations of the blood:

To Obtain a Specimen of Blood.—The necessary specimen of blood is best obtained from the lobe of the ear, but the finger-tip is more commonly selected as the part to be punctured. The puncture is made with a rather large bayonet-tipped aseptic needle, or a specially devised blood lancet.

After thoroughly cleansing the lancet and site of the proposed puncture with alcohol or ether followed by sterile water, the part is wiped perfectly dry and held firmly while the operator with a rapid wrist motion makes a puncture of sufficient size to cause several drops of blood to flow freely. This should always be allowed to flow of its own accord, the operator being careful not to squeeze the part and thus dilute the blood with lymph from the surrounding tissue, which would give rise to an error in the result.

The first one or two drops coming from the puncture should be discarded, after which a perfectly clean cover-glass is applied to the next drop of blood as it oozes out. The cover-glass is at once placed blood side downward upon a perfectly clean glass slide. A thin film of blood should be obtained as a

result of this contact made in the presence of slight heat and without pressure.

An excellent smear, in which the corpuscles are disposed in a very uniform manner, can be made by touching a fresh drop of blood with the flat surface of a clean slide and applying the edge of another slide held somewhat obliquely to the drop. Wait till the blood has run along the edge, then drag the edge of the slide along so as to make an even film. Dry and fix either by heat for two minutes at 160°, or by equal parts of ether and alcohol, or by formalin vapor.

The Technique of the Examination.—The specimen can now be stained and examined under a microscope with both high and low powers in a moderate light for:

1. Changes in the number and condition of the red cells.
2. Changes in the number and condition of the white cells.
3. Increase in blood plaques.
4. Presence of parasites and foreign bodies.

In gastro-intestinal cases you will rarely need to carry your examinations beyond 1 and 2.

Blood Counts.—If it becomes necessary to make an exact count of the red and white cells, many methods and instruments have been devised to carry out the procedure. The instruments of Thoma-Zeiss and Gowers are, however, still considered to be among the best.

The Thomas-Zeiss hemocytometer consists of two graduated capillary pipettes for diluting and mixing the blood and a chamber in which is placed a definite portion of the diluted blood for the purpose of counting the corpuscles under the microscope. One pipette is used for collecting and diluting the blood to count the red cells and another for collecting and diluting the blood to be used in counting the white cells.

To count the red blood cells the blood is drawn up in the pipette to the mark 1 and the diluent (which may be a normal salt solution, roughly, 5i to Oi) added until the mark 101 is reached. This makes a dilution of 1 to 100. If the blood is

drawn only to the mark 0.5 and the diluent added as before, a dilution of 1 to 200 is obtained.

After mixing the blood in the bulb of the pipette, it is put on the glass slide containing a counting chamber. A dilution of 1 to 200 is preferable to make an easy count and avoid crowding the blood cells in the squares.

The counting chamber is ruled into 400 small squares separated into groups of 16 squares by double lines. The surface of a square is 1-400th of a square millimeter, and the depth of the cell being one-tenth millimeter, the space overlying each square is 1-4000th of a cubic millimeter.

The number of corpuscles counted in all the squares is multiplied by 400, and the result by the dilution, 1:100 or 1:200 depending upon the point to which the blood was drawn in the pipette, 1 or 0.5.

This result is divided by the number of squares counted, and the final result is the number of corpuscles in a cubic millimeter of blood.

In *counting the white blood cells* a 0.5 per cent. solution of acetic acid is used, which dissolves the red cells and renders the white cells more prominent.

A dilution of 1:10 is made by drawing the blood up in the tube to the mark 1 and adding the diluent to the mark 11. The leucocytes are then counted in an area of the counting chamber equal to 800 small squares, and the calculation made as before. For example, if 120 leucocytes were counted in 800 squares the result would be determined as follows: $120 \times 4000 \times 10 \div 800 =$ the number of leucocytes per c. mm.

To Estimate the Hemoglobin.—In estimating the percentage of hemoglobin in a given specimen of blood we have again many instruments to select from. Von Fleischel's hemoglobinometer is, however, the instrument most preferred. The color of a definite volume of blood, in an aqueous solution of definite strength, is compared with that of a glass prism which ranges from a deep pink color at the thick end to the thin portion which is almost colorless. A graduated scale of fig-

ures accompanies the prism, each degree of color corresponding to a percentage of hemoglobin.

A capillary pipette is applied to a drop of blood and then quickly washed in one of the two compartments of the mixing chamber. Both compartments are then filled with water to the brim, care being taken not to mix the water from one compartment with that in the other. By moving the graduated slide a comparison of color is made and the reading taken.

Another excellent apparatus for the purpose, which economizes time, is that of Dare. It consists of a capillary chamber filled directly from the blood drop, a color scale, and a source of light approximately constant in character and intensity; a candle in a darkened room answers well. The readings of this apparatus are slightly higher than those from others, but allowance has been made for this.

Various Diseased Conditions that may be Diagnosed by the Blood.—Lead colic has been mistaken for gastralgia, the pain of gastric ulcer or cancer, for hepatic colic, intestinal colic, and for intestinal obstruction especially. An examination of the blood should prevent such an error by revealing the basophilic granulations in the red corpuscles which are nearly always present in lead-poisoning.

Acute abscesses (when non-tubercular) in the appendix, or in the abdomen anywhere (or anywhere in the body, as a rule) are likely to produce a leucocytosis of 15,000 or more.

Appendicitis. According to Cabot¹ in acute appendicitis the development of gangrene or general peritonitis is almost invariably accompanied by a rise of leucocytes to upwards of 20,000.

Intestinal obstruction develops within a few hours a rapid increase in the number of leucocytes, which reaches usually 20,000 by the end of twenty-four hours, when the obstruction is complete. When it is partial only, the leucocytosis will be in proportion. When gangrene of an intestinal loop sets in, the leucocytes may reach 25,000 or 30,000 except when it results from an infarct of the superior mesenteric artery.

¹ "Am. Text-Book of Surgery," Philadelphia, 1903.

LECTURE XV

A SYMPTOMATIC GUIDE TO DIAGNOSIS

For the inexperienced practitioner especially, and at times for any physician however experienced, it should be a great convenience to have at hand a list of the various diseases or symptom-groups which the prominent symptoms encountered might signify. I have therefore carefully prepared the following tabular statement including the leading symptoms of gastro-intestinal affections with, placed opposite to each, as full a summary as possible of the diseases or other conditions which have been known to cause it. I cannot claim these lists to be exhaustive, but you will find them to contain certainly most of the possible causes of each symptom.

SYMPTOMS	POSSIBLE CAUSES
Anorexia, or impaired appetite.	Fevers and most acute diseases ; cancer ; tuberculosis ; anger or any powerful emotion ; worry ; anxiety ; fright ; hysteria ; dyspepsia, especially the atonic form ; achylia gastrica ; hypochlorhydria, and exceptionally HCl excess ; epidemic influenza ; chloro-anæmia ; diseases attended with suppuration ; alcoholism ; prolonged insomnia ; any wasting or depressing form of disease ; neurasthenia ; gastritis ; catarrhal inflammation of any mucous membrane in the gastro-intestinal tract, or of the bile ducts.
Breath, fetor of, or foul taste in mouth.	Local inflammations or ulcerations of gums, tongue, tonsils, pharynx or nasopharynx ; retention in the mouth of decomposing food ; caries of teeth ; stomatitis ; pyorrhea ; retropharyngeal abscess ; gastroduodenal catarrh ; jaundice ; certain foods and drugs ; certain lung diseases, as tubercular cavity, gangrene or bronchiectasis ; diabetes mellitus ; retention of stomach contents from atonic dilatation

of stomach, pyloric stenosis, or pylorospasm ; cancer of the stomach, esophagus, or any part of oral cavity or upper air passages ; scurvy ; necrosis of jawbone ; constipation ; acute exanthems ; acute infectious diseases ; anæmia ; abscess of sublingual or submaxillary gland ; leucoplakia.

Bulimia, or excessive appetite.

Insufficient mastication ; obstruction of thoracic duct ; gastric hyperacidity (hyperchlorhydria) ; gastric ulcer ; acid gastritis ; diabetes ; epilepsy ; various psychoses ; hysteria ; neurasthenia ; insanity ; idiocy ; tumor, or other affection of the brain ; Addison's disease ; tuberculosis ; syphilis ; Basedow's disease ; pregnancy ; disease of the uterus ; chronic gastritis ; chronic enteritis ; gastrectasis ; pertussis ; worms ; exceptionally carcinoma ; exophthalmic goitre ; after starvation ; convalescence from fevers or other acute diseases.

Constipation.

Insufficient food ; lack of coarse foods, vegetables, or fruits ; movable kidney or the downward displacement of any abdominal organ ; hyperchlorhydria ; pylorospasm, or any obstruction of the pylorus ; negligence as to regularity in time of going to stool ; insufficient mastication ; exceptionally, deficient gastric secretion ; lack of exercise ; deficiency of bile ; weakened musculature of gastric, intestinal, or abdominal walls ; excessive horseback riding, as in cavalrymen ; prolonged sweating or polyuria ; chronic pancreatitis ; hernia ; cancer of esophagus or stomach or any portion of the intestines ; fissure or fistula in ano ; persistent Meckel's diverticulum ; stricture or obstruction in any part of the alimentary canal ; hemorrhoids ; rectal ulcer ; prostatitis ; tender or displaced uterus, or ovary ; pyosalpinx ; deranged innervation, as in nervous diseases, especially irregular or spasmodic contractions of intestinal muscles ; neurasthenia ; hysteria ; anæmia ; peritonitis ; appendicitis ; chronic portal congestion ; abuse of purgatives ; the administration of iron, lead, opium, or any astringent ; cerebral congestion ; meningitis ; tumor of brain or other cerebral diseases ; adhesions of coils of intestine to each other, or to neighboring structures ; vol-

Debility.	vulus, partial or complete ; intussusception, acute or chronic ; the acute stage of nearly all fevers and general infections, with the exception of typhoid fever ; pelvic abscess ; pregnancy ; tumors pressing upon the intestines. Carcinoma ; neurasthenia ; vomiting or diarrhea ; chronic gastritis or enteritis ; underfeeding ; syphilis ; tuberculosis ; malaria ; achylia gastrica ; confinement to bed ; depressing drugs, or overdosing with any drugs ; any acute illness or exhausting disease ; obstruction of thoracic duct ; any severe infection.
Defecation, painful.	Hemorrhoids ; cancer of rectum ; rectal ulcer ; fissure or fistula in the anus ; proctitis or any disease of rectum ; disease of any of the pelvic organs accompanied by sensitiveness to pressure ; caries of the sacral spine ; tenderness of the sacral spine or coccyx from any cause ; prostatitis or ovaritis.
Discolorations of the skin —jaundice or bronzing.	Yellow fever ; gastric dilatation ; gastric ulcer ; habitual constipation ; pregnancy ; cancer ; tuberculosis of abdominal viscera ; pernicious anæmia ; disease of the liver or bile ducts ; exophthalmic goiter ; acetanilid poisoning, causing a slate color ; tinea versicolor ; syphilitic eruptions ; scleroderma ; extension of gastroduodenitis to gall bladder and ducts ; toxæmia ; any obstruction to flow of bile, as from a neighboring tumor or displaced kidney ; Addison's disease ; mental emotion ; acute infectious diseases ; argyria ; acute yellow atrophy of the liver ; hepatic cirrhosis or congestion ; chronic malaria ; bronze diabetes ; numerous chronic skin affections, with irregular pigmentation ; poisoning with various drugs, including silver, arsenic, and picric acid ; sarcoma ; alkaptonuria.
Diarrhea.	Excessive action of physic ; intestinal catarrh ; tumor in or near the bowel ; poisonous dose of almost any metal except lead ; ruptured pelvic abscess, appendiceal abscess or abscess opening into any part of the intestine ; appendicitis ; presence of ptomaines or toxins ; pernicious anæmia ; cholera ; typhoid fever ; Addison's disease ; syphilis ; influenza ; proctitis ; pneumonia ; tuberculosis ; ulceration in the bowel from any cause ; the exanthems ; fecal stasis from prolonged constipation ; uræmic

	conditions in Bright's disease ; achylia gastrica ; the crisis of certain fevers, including especially febricula and simple continued fever ; fright ; anger or other great emotion ; neurasthenia ; exophthalmic goiter ; movable kidney ; any of the forms of cholera ; retroflexion of the uterus ; septicæmia ; diabetes ; the first stage of dysentery ; intussusception ; fissure in ano ; excessive ingestion of fruit or certain vegetables or any other food causing excessive fermentation ; hypochlorhydria and exceptionally hyperchlorhydria.
Depression, mental or nervous.	Achylia gastrica ; hypochlorhydria ; exceptionally hyperchlorhydria ; chronic gastritis ; chronic enteritis ; diseases of the sexual organs, especially ovarian disease ; anæmia or chlorosis ; obstruction of the bile duct ; chronic appendicitis ; underfeeding ; prolonged loss of sleep ; melancholia ; prolonged overstrain of brain or nervous system ; neurasthenia ; any chronic lowering disease.
Emaciation.	Tuberculosis ; Addison's disease ; hysterical anorexia ; starvation or underfeeding ; chronic malarial disease, and any chronic disease producing a profound dycrasia ; cancer or sarcoma ; chronic inflammatory diseases of the intestines ; chronic diarrhea ; gastric atrophy ; dilatation of the stomach ; long-continued fevers ; prolonged lactation ; marasmus ; stricture of esophagus ; obstructed pylorus ; obstruction in any part of alimentary canal ; very prolonged gastric ulcer ; chronic suppuration ; intestinal parasites ; obstructed thoracic duct ; final stages of all serious diseases ; cholera ; diabetes.
Eructations.	Acute or chronic indigestion ; overfeeding ; acute or chronic gastritis ; fermentation in the stomach or small intestines ; insufficiency of cardia ; organic affections of stomach or pancreas ; neurasthenia or hysteria ; nervous dyspepsia ; aneurism of thoracic aorta.
Excitability, undue.	Hyperchlorhydria ; neurasthenia ; uratic diathesis ; pregnancy ; overstrain of the nervous system ; prolonged eye strain ; cerebral softening ; alcoholism or excessive use of most nervine drugs.
Flatulency, gastric or intestinal.	Chronic indigestion ; nervous dyspepsia ; neurasthenia or nerve exhaustion ; chronic gas-

Headache.

tritis or enteritis ; chronic appendicitis ; hysteria ; hyper- or hypochlorhydria ; carcinoma or sarcoma in the stomach or intestines ; intestinal obstruction ; peritoneal adhesions.

Constipation and various diseases of the digestive organs ; anæmia or sudden hemorrhage ; nephritis ; constitutional diseases ; specific infectious diseases and the onset of most febrile attacks ; intoxications, as from lead, alcohol, mercury, tobacco, or other drugs ; high blood pressure ; pregnancy ; uræmia ; neuroses, as in epilepsy, hysteria, neurasthenia ; exophthalmic goiter ; overaction of amyl nitrite or of nitroglycerin ; blasting or other work with dynamite ; inflammatory or organic diseases involving the nervous system, as in meningitis, neuritis, tumor, or abscess ; reflex from diseases of the ear, eye, nasopharynx, or sexual organs ; physical or mental fatigue ; cerebral congestion or softening ; cerebral syphilis.

Hemorrhage, or loss of blood or altered blood, by the mouth or rectum.

Gastric ulcer or erosions ; tubercular phthisis ; rupture of pulmonary vessel from aneurism (hemoptysis) ; hepatic cirrhosis ; gastric cancer ; aneurism rupturing into esophagus, stomach, or intestines, or rupture of varicose veins into any of these ; enlarged spleen ; injuries to the mouth, nose, or throat in the case of unconscious persons, infants, and malingerers, the blood being swallowed ; injury to stomach from straining or blows ; vicarious menstruation by way of the stomach ; cancer of the liver exceptionally ; corrosive poisons swallowed ; severe anæmias ; scurvy ; purpura hæmorrhagica ; chronic nephritis ; certain acute infectious diseases, such as yellow fever, smallpox, and cholera ; acute yellow atrophy of liver ; duodenal ulcer ; typhoid, dysenteric or other ulcers of the intestines ; hemorrhoids ; cancer of the rectum ; foreign bodies ; fissures or polypi of rectum ; strangulated hernia ; intussusception in children ; colitis in children ; amyloid disease of the intestines ; aneurism or thrombosis of superior mesenteric artery ; portal thrombosis ; jaundice ; diarrheal attacks complicating exophthalmic goiter ; intestinal parasites ; fecal impaction ; unskilled use of instruments.

Insomnia, or impaired sleep.	Neurasthenia ; hyperchlorhydria ; gastric or duodenal ulcer ; constipation ; intestinal catarrh ; cerebral disease ; pain anywhere in the body from cancer or other cause ; deficient food ; overloaded stomach : indigestion, gastric or intestinal, from any cause ; anxiety or worry ; fear or any powerful emotion ; mental excitement of any kind.
Irritability of temper.	Neurasthenia ; chronic indigestion ; loss of sleep ; over-fatigue of nervous system ; hyperchlorhydria ; the uratic diathesis ; impairment of cerebral tone from any cause ; prolonged eye strain ; pregnancy.
Nausea, or vomiting.	Acute or subacute gastritis from putrefying, indigestible, or irritating food ; overloaded stomach ; chronic gastritis ; alcoholism ; anæsthetics or opiates in full doses ; spasmodic or mechanical obstruction of the pylorus from a tumor or the cicatrix of an ulcer causing stenosis ; gastric cancer ; gastric or duodenal ulcer ; dilatation of the stomach ; irritant poisons ; administration of emetics ; pregnancy ; locomotor ataxia ; centric or toxæmic as seen in Addison's disease ; meningitis ; cerebral tumor, abscess, or congestion ; acute infectious diseases and onset of most fevers ; reflex of obscure cerebral origin ; irritation of pharynx, larynx, or thyroid gland ; hardened ear wax ; Bright's disease ; appendicitis ; perforation of the intestines ; acute peritonitis ; acute enteritis ; incarcerated or strangulated hernia ; intestinal obstruction from any one of numerous causes ; acute disease of the liver ; cholecystitis, cancer, or other disease when it causes stenosis of the bile ducts ; hepatic colic ; anæmia ; pyelitis ; movable or floating kidney ; hydronephrosis ; disease of the pancreas ; reflex from disease of the uterus, ovaries, or tubes ; reflex from diseased bladder or prostate gland ; hysteria ; neurasthenia ; intestinal parasites ; obstructed ureter ; subphrenic abscess ; stricture of the esophagus ; migraine ; prolonged eye strain in very susceptible persons ; any one of various renal affections, as calculus, tuberculosis, syphilis, cancer, or other tumor of either kidney.

Oppression or weight in stomach.	Chronic gastritis; nervous dyspepsia; neurasthenia; premonitory stage of gastric hemorrhage; atony or dilatation of the stomach; deficient secretion of HCl and the ferments (hypopepsia or hypochlorhydria); achylia gastrica; gastric atrophy; pyrosis; gastric hyperacidity; any form of acute gastritis; gastric ulcer; gastric cancer; dilatation of the stomach; diseases of the pancreas; chronic gastritis.
Pain referred to the right hypochondriac region or lower edge of liver.	Hepatic colic; cholecystitis; certain diseases of the liver; movable right kidney; hydro-nephrosis; calculus in the right kidney or its pelvis; renal colic; tumor of the liver, gall bladder, bile duct, pylorus, or the intestines; ulcer of the pyloric end of the stomach or of duodenum; rheumatism; traumatism; ulcer of the cecum; right-sided pleurisy or pneumonia; diaphragmatic pleurisy; appendicitis.
Pain, referred to the region of the stomach.	Excessive secretion of HCl (hyperchlorhydria); excessive gastric fermentation with large formation of organic acids and gases; round ulcer or erosions of the stomach; gastric cancer; gastropptosis; gastralgia from purely nervous causes; atony, or dilatation of the stomach; foreign bodies swallowed and retained in the stomach; ulcer of the duodenum; phlegmonous or simple acute gastritis; perigastritis; hyperæsthesia of the gastric mucous membrane; acute indigestion; morphine habit; disease of the vertebræ; pneumonia in children; cancer or inflammation of the pancreas; disease of the pleura; especially diaphragmatic pleurisy; disease of the heart or pericardium; affections of the intercostal nerves; herpes zoster; kinking of the ureter in cases of movable or floating kidney, especially on the left side; abscess of the liver; intestinal disorders; cramp of the gastric muscles from spasmodic or any obstruction of the pylorus; rheumatism of the abdominal muscles; passage of biliary or renal calculi; subphrenic abscess; locomotor ataxia; hysteria; hypochondriasis; localized peritonitis; traumatism.
Pallor of the skin.	Recent hemorrhage; Bright's disease; tuberculosis; malignant growths; acute or chronic

	<p>diarrhea ; chronic gastric or intestinal indigestion ; chronic gastric ulcer or severe hemorrhage in an acute one ; chronic gastric catarrh ; chronic malaria ; syphilis ; gastric dilatation ; gastropptosis or enteroptosis ; morphine habit and some other drug habits ; lead poisoning ; stricture of the esophagus ; various kinds of poisoning, both from the outside, as from drugs, illuminating gas, etc., or from auto-toxæmia ; prison life or long confinement in any badly lighted rooms ; starvation ; deficient oxygen from poor ventilation or overcrowding, especially in cities ; chronic ill health from almost any cause ; idiopathic or pernicious anæmia.</p>
Ptyalism, or salivation.	<p>Disease of the teeth or gums ; dentition ; stomatitis ; glossitis ; mumps ; acute tonsillitis or peritonsillitis (quinsy) ; nausea ; disease of the pancreas ; any one of various diseases of the stomach ; intestinal worms and probably other abnormal conditions in the bowels ; tumor of the medulla or facial nerve ; pregnancy ; facial neuralgia ; mental disease ; excessive mental emotion ; psychic neurosis ; the action of certain drugs, especially mercury and gold in excessive doses or small doses often repeated ; strong acids or alkalies ; jaborandi ; physostigma ; muscarin ; tobacco ; the preparations and compounds of iodine and copper and the nauseating medicaments ; various spicy food accessories, as horseradish, ginger, etc. ; some obscure diseases of the brain or spinal cord, as some forms of paralysis ; progressive muscular atrophy ; rabies ; hystero-epilepsy ; atony of the submaxillary ganglion ; irritation of cordi tympani ; irritation of cervical sympathetic ; early stages of variola or typhoid fever ; and the crises of fevers exceptionally.</p>
Regurgitation, or rumination.	<p>Relaxation of cardiac orifice of stomach ; neurosis ; existence of sac or diverticulum in esophagus ; habit ; certain forms of indigestion ; insanity ; epilepsy ; idiocy ; neurasthenia ; hysteria.</p>
Succussion, or splashing sounds in the abdomen.	<p>Atony, or dilatation of stomach ; hydropneumopericardium ; gastropptosis ; enteroptosis ; when such sounds are demonstrable over cecum, sigmoid flexure, transversæ colon, or</p>

	other part of the large intestine, they signify atony or dilatation of the same.
Tenderness on pressure over epigastrium.	Functional or organic disease in abdominal plexuses of the sympathetic nervous system ; gastric or duodenal ulcer ; acute or chronic gastritis ; hypochondriasis ; hysteria ; Addison's disease ; gall stones ; acute yellow atrophy of liver ; pancreatitis ; acute pericarditis ; diaphragmatic pleurisy ; irritant poisons ; peritonitis ; aneurism of abdominal aorta ; rheumatism of abdominal muscles ; appendicitis exceptionally.
Tenesmus.	Dysentery ; proctitis ; catarrhal enteritis ; diarrhea caused by irritant poisons ; overaction of mercury or other cathartics ; membranous enteritis ; irritable bladder with vesical tenesmus ; impacted feces ; worms ; foreign body in rectum ; hemorrhoids ; polypus ; adenoma or cancer of rectum ; intussusception in children ; enlarged or retroflexed uterus.
Tongue coated or furred.	The use of tobacco ; mouth-breathing ; nasopharyngeal catarrh ; so-called bilious attacks ; the exanthems or any fever ; any systemic toxæmia ; autotoxæmia ; gastritis ; gastroduodenitis ; enteritis ; cancer anywhere in alimentary canal ; alcoholism ; milk diet ; neuralgia of second or third division of trigeminus ; fracture involving foramen rotundum (unilateral) ; hemiplegia ; rough tooth ; tonsillitis ; thrush ; Riggs' disease ; caries of the teeth ; disease in any part of the mouth ; retropharyngeal abscess.
Tympany, abdominal.	Gastric or intestinal fermentation ; gastric or intestinal atony ; dilatation of the stomach ; gastric catarrh, cancer, or ulcer ; pyloric stenosis ; typhoid fever ; appendicitis ; peritonitis ; hysteria (pneumatosis) ; intestinal obstruction ; sepsis ; strangulated hernia ; pressure on intestines by tumor or fluid ; defective innervation with either atony or spastic contraction of intestinal walls ; constipation ; perforating ulcer of stomach or intestines ; marked emphysema ; ascites from hepatic cirrhosis or other causes ; acute yellow atrophy of liver ; air swallowing.
Vertigo	Neurasthenia ; lithæmia ; gastric hyperacidity ; chronic gastritis ; intestinal parasites ; arteri-

osclerosis ; valvular cardiac disease ; injury to vestibule of inner ear ; aneurism ; Ménière's disease ; eye strain ; epilepsy ; anæmia, especially on exertion ; tumors of the brain, especially of the cerebellum ; abuse of tea, coffee, alcohol, or tobacco ; auto-intoxication ; the chronic form of nephritis ; locomotor ataxia ; disseminated sclerosis (rarely) ; mental strain or excitement in neurotic persons ; mechanical disturbance of equilibrium as in seasickness, in railway or elevator sickness ; transitory, as in looking at a rapidly rotating body ; vertical, caused by looking down from a height ; lateral, which may occur in a person walking alongside a fence ; nocturnal, felt in act of going to sleep.

PART III
METHODS OF TREATMENT

LECTURE XVI

PROPHYLAXIS: PERSONAL HYGIENE AND FOOD REQUIREMENTS

PROPHYLAXIS, if not exactly treatment, is better than treatment. To prevent disease is always much better even than to cure it when it has come. This is true from the humanitarian point of view if not according to business principles; and in these lectures I shall teach you that medicine is something more than business or a trade—that it is our duty as physicians endowed with superior knowledge upon such subjects, not only to protect in all possible ways from the dangers of disease the families and individuals intrusted to our care, but also to aid in protecting the communities wherein we dwell, by giving timely warning as to threatening unhygienic conditions and pointing out the way to remedy them.

Professor R. A. F. Penrose, in lecturing upon obstetrics some twenty-five years ago, was accustomed to say that the best way to insure the birth of healthy children was to see to it that the building material was good—*i. e.*, to make sure that the ancestors were healthy. The same may be said as to preventing disease of the digestive system; the surest way to secure healthy digestive organs is to be born with them.

Unfortunately, however, a very large proportion of civilized mankind are born with a strong predisposition to disease of these organs, and such persons need to be doubly careful to follow hygienic rules. By living temperately, eating the foods best adapted for easy and rapid digestion, masticating all ingesta with the greatest possible thoroughness, and avoiding all excesses and irregularities, not only in eating and drinking, but also in work and play, such inheritors of poor constitutions, including especially faulty digestive systems,

may often, and constantly do, greatly outlive the most robust people whose lives are full of dissipation and reckless disregard of hygiene. This subject of prophylaxis will come up particularly in advising as to the care of children, their diet, exercise, baths, physical training, education, and, later, the choice of an occupation. As to all of these, you, as family physicians, will be, or should be, called upon to decide and lay down for the parents explicit directions regarding every detail. To consider all these subjects as fully as their importance demands is impracticable in this place, and you will find them exhaustively discussed in the best works on pediatrics. A few general principles, however, should govern in the hygienic management not only of delicate children, but of adults who have a predisposition to digestive disorders. These may be summarized briefly as follows: Secure for them, first of all, an abundance of pure fresh air both by day and by night. When practicable, such children or older patients should live in the country with plenty of open spaces about their houses, and the latter should be equipped with perfect systems of ventilation.

Personal Hygiene.—In reality, everything pertaining to both personal and public health is in direct relation to the prevention of gastro-intestinal diseases, since all hygienic faults tend to lower the nerve tone and set up finally disease in various parts of the body, including nearly always the digestive system. The different systems are in such close sympathetic relation with each other that no one of them can be seriously injured without the others being liable and likely to become ultimately involved.

Besides care of the diet, the hygienic precautions which are especially important to prevent the development of disease in the alimentary canal should include an abundance of pure, fresh air (good ventilation), a proper development of the muscles, especially the trunk muscles (secured by outdoor exercise in part), and the daily use of them in such a way as to stimulate gastric and intestinal peristalsis and insure a suffi-

ciently active circulation of the blood in all of the digestive glands. This is constantly neglected by most professional persons and sedentary workers, to say nothing of the idle class.

Delicate persons need also to take specially good care of the skin, by which is meant not only keeping the latter clean, since warm baths for this purpose are often greatly abused, but also a proper training of it by a daily rubbing or kneading of the entire surface of the body, which can be most efficiently done in most cases after a transient application of cold water with a sponge or wet towel.

Such a daily practice is of the greatest efficacy in maintaining an active circulation of the blood in the skin, by means of which liability to take cold upon ordinary exposure to changes of temperature, and the danger of internal congestions, is greatly lessened. The prophylactic value of these two practices—daily exercise of the trunk muscles and surface frictions, especially after the application of cold water—can scarcely be overestimated.

The teeth and gums should also receive special care. At least once daily the teeth should be brushed in such a way as to remove all remaining particles of food, and it is safest to cleanse the teeth after every meal.

When such pains are taken to keep the teeth and gums always free from decomposing matter, there is infinitely less liability to the development of caries or other disease in or about the teeth; but, in addition to these precautions, every person should have his mouth examined by a dentist once or twice a year to see that no disease has been set up in any of its structures that could carry infection into the parts below. There cannot be good digestion without efficient mastication, and this is impossible without good teeth.

Care should be taken also to avoid the development of chronic catarrhal disease in the nose, nasopharynx, or pharynx, since the mucus swallowed from these parts is always swarming with bacteria, and liable finally to infect the stomach.

People who inherit a tendency to indigestion should go to the table with a quiet mind and avoid eating while seriously fatigued. They should spend plenty of time at meals, and engage in no active work, either mental or physical, for half an hour after their lighter meals, or for a full hour at least after dinner. When the digestion is already much impaired the recumbent posture for some time after each meal will be advantageous. Such persons should lead as quiet, even lives as possible, avoiding all excesses in the way of emotion or passion, and especially sexual excesses or irregularities.

Seven to eight hours daily of sound, refreshing sleep are also requisite to good health; but if the foregoing health rules are strictly followed, good sleep will naturally follow, except in conditions of disease, when the cause needs to be removed by having the disturbing disease cured. Hypnotic drugs rarely effect the end desired. They always do harm when long continued, and fail frequently to afford even temporary relief. The taking of them should never be left to the discretion of the patient.

As to clothing, the indications should be plain: Allow as little constriction of the body, especially about the chest and upper abdomen, as possible; and for those who are most of the time indoors the rule should be to wear no heavier clothes than are necessary to keep them comfortable in warm rooms, extra wraps to be put on when necessary for any unusual exposure.

The Hygiene of Eating and Drinking.—The food should be simple, digestible, and thoroughly prepared for ingestion in the case of older children and adults by sufficient mastication and insalivation. The meals should be neither too near together nor too far apart. For invalids numerous small feedings are sometimes best, but in the case of adults not ill more than three or four meals a day are inadvisable, and there should rarely be less than two. It is important, of course, that delicate persons should not fail to take enough nourishment to maintain nutrition certainly at the proper level, and more care

is necessary in this respect for them than for other persons. On the other hand, it is equally important to avoid overeating, and this danger, for most Americans at least, is greater than the other. There should be always the proper ratio between alimentation and oxygenation, as I have pointed out hitherto in various papers concerning the management of consumptives and other classes of invalids.¹ In other words, the more oxygen one takes into one's lungs the more food one requires and can safely take, whether the oxygen be secured by abundant ventilation while resting indoors, by spending much time in the open air, even sitting on piazzas, or better, by enjoying such passive outdoor exercise as driving, automobiling, or sailing, by active exercise indoors with good ventilation, or best of all by active exercise in the open air.

Definition of Food.—It will be in place here to define what food is, and I have tried to formulate in few words a satisfactory definition of it. *A food is any substance which, when introduced into the system, can supply heat or force or repair tissue waste without exerting any disturbing or medicinal action.*

Alcohol and Food Accessories.—You will observe that by no possible twisting of this definition can it be made to include alcohol or any of the so-called food accessories which are often taken with our food for the purpose of stimulating either the brain or other part of the nervous system, or the digestive apparatus.

In making a clear and sharp distinction between the foods proper and the numerous substances which, by a confusion of thought, are often represented as in some sense foods, I by no means intend to condemn *in toto* the use of the latter substances. I only insist upon clear definitions of them and clean-cut conceptions concerning them. I believe that the savory spices are sometimes useful in disease, and in their moderate use by adults often excusable in health for the reason that tempo-

¹ The Ratio that Alimentation should Bear to Oxygenation in Disease of the Lungs, *The Med. News*, September 22, 1894.

rarily they may perform a needed service by increasing the appetite and the enjoyment of dining. But for their injurious after-effects the same might be said of alcoholic beverages. They increase the sociability of festive occasions. It seems to me in the highest degree important that in the instruction of the young the exact scientific truth should be taught, and that in the management of delicate invalids, with irritable nervous systems and greatly enfeebled digestions, we physicians should not deceive ourselves and our patients by a confusion of definitions and reasoning regarding such substances. Let us call a spade a spade, and limit the word food to substances useful for nutrition, and class strictly as medicines or drugs all those articles which, being entirely without true food value, find their chief use as stimulants or irritants of tissue. The fact that alcohol can be consumed in the body to some extent with the production of heat, no more makes it a food than the fact that both it and benzine can be burned in stoves with the liberation of heat, constitutes these substances fuels. In both cases the process of combustion is more or less unmanageable and liable to be followed by dangerous results.

In health, exercise and sufficient fresh air with the resultant oxidation processes are the normal excitants of appetite. When we eat our meals in good company and amid as pleasant surroundings as possible, after a sufficient lapse of time since the previous meal, we do not, unless out of health, need any artificial irritant to produce a flow either of saliva, of gastric juice, of bile, or any other of the digestive juices. Prolonged mastication will insure abundant insalivation at least.

If we are out of health we need a physician, and sometimes, doubtless, medicine, to overcome a persistently deficient secretion; but physicians do not usually find it advantageous to recommend the constant use of any one drug year after year, and so on through life. Indeed, competent observers agree that the prolonged use of any drug which at first produces stimulation will, in the end, cause overstimulation and, finally, depression of the parts stimulated.

When, therefore, we regularly and habitually take with our meals alcoholic beverages, tea, or coffee, or any of the spices beyond the very small amount required to give a slight flavor to the food, we should do so solely on the ground that we like them and enjoy the taste of them as well as the stimulating effect of them upon the nervous system. With this clear understanding of the matter, we shall be less likely to abuse these substances, and to force them upon the unwilling palates of children at an age when they can do most harm, and when there can scarcely exist even the possibility of benefit to be derived from them.

Having thus disposed of food accessories which are not foods at all, we come now to the

Classification of Foods.—The usual division is into proteids, carbohydrates, hydrocarbons or fats, salts, and water.

The proteids are nitrogenous elements obtained usually from the flesh of animals, from eggs, milk, the legumes (beans, peas, etc.), the grains, and other vegetable sources. They are indispensable for the repair of tissue waste, since they enter into the composition of the cells of all the structures of the body. They are also to some extent utilized for the production of heat and force.

The carbohydrates, as the name indicates, are foods containing carbon and hydrogen, along with generally other elements, but usually no nitrogen, and are obtained from a great variety of sources, including especially the grains, the legumes, and other vegetables, fruits, etc. They are practically non-existent in meats and fish. The carbohydrates are oxidized in the body with the production of heat and force.

Fats, or the oily part of food, are obtained from both the animal and vegetable kingdoms, and like the carbohydrates, find their use in producing force and maintaining the heat of the body. For these purposes they are more efficient than the former, though for many persons they are decidedly less digestible.

The salts include the chloride of sodium, carbonate of so-

dium, and phosphates and sulphates of potassium, sodium, and magnesium as well as minute amounts of iron and of certain other metals.

Water constitutes a very large proportion of the body, being about two-thirds the amount of the whole by weight. It is the most universal solvent in Nature, and plays a most important rôle in the processes of nutrition. All of these food elements are necessary to perfect health, though one or more of them can be dispensed with for short periods. Since the proteids are indispensable for the repair of tissue waste and are also available to some extent for the production of heat and force, life can be maintained longer upon a proteid diet with the addition of sufficient water and salines than would be possible with a diet embracing all other varieties of food, but without proteids. When a person attempts to live for prolonged periods upon a diet containing but little proteid material, the necessary nitrogen is taken from the muscular and other tissues of the body itself and in this way a serious form of wasting occurs. Examples of the kind have been noted in poor sewing women of cities who have endeavored to live upon a diet of white bread and butter and tea, with the inevitable result of a serious loss of flesh and strength. Various estimates have been given by authors of the relative proportions of proteids, carbohydrates, etc., required to maintain nutrition. The following table gives the estimates of five prominent physiologists as to the food requirements of healthy men engaged in moderate manual labor:

PROPORTIONS OF DIFFERENT FOODS IN THE NORMAL DIET
ACCORDING TO VARIOUS AUTHORITIES

	MOLESCHOTT	RANKE	VOIT	FOSTER	ATWATER
	Grms.	Grms.	Grms.	Grms.	Grms.
Proteid	130	100	118	131	125
Fats or Hydrocarbons	40	100	56	68	125
Carbohydrates	550	240	500	494	400

You should bear in mind that women require, on an average, less than men, and that a person at rest can be adequately sustained, without loss of weight, on somewhat more than one-half the quantities of food required for one employed at manual labor.

FOOD REQUIREMENTS UNDER DIFFERENT CONDITIONS

The following table of standards for American dietaries is given by Atwater

	Proteid	Fuel value	Nutritive ratio
	Grams	Calories	
Woman with light muscular exercise .	90	2,400	1:5.5
Woman with moderate muscular work	100	2,700	1:5.6
Man without muscular work			
Man with light muscular work . .	112	3,000	1:5.5
Man with moderate muscular work .	125	3,000	1:5.8
Man with hard muscular work . .	150	4,500	1:6.3

That even the lowest of the figures given in the foregoing tables are excessively high has long been maintained by some writers, and especially that the amounts of proteid therein prescribed are excessive for the real needs of nutrition.

Some Recent Experiments Concerning Food Requirements.
—Professor R. H. Chittenden, Director of the Sheffield Scientific School of Yale University, in a recent very interesting and suggestive article on this subject, entitled “Physiological Economy in Nutrition,”¹ wrote: “Why, now, should we assume that a daily diet of over 100 grams of proteids, with fats and carbohydrates sufficient to make up a fuel value of over 3000 large calories, is a necessary requisite of bodily vigor and physical and mental fitness? Mainly because of the supposition that true dietary standards may be learned by ob-

¹ *Popular Science Monthly*, June, 1903.

serving the relative amounts of nutrients actually consumed by a large number of individuals so situated that the choice of food is unrestricted. But this does not constitute very sound evidence. It certainly is not above criticism. We may well ask ourselves whether man has yet learned wisdom with regard to himself, and whether his instincts and appetites are to be entirely trusted as safe guides to follow in the matter of his own nutrition. The experiments of Kumagawa, Sivén, and other physiologists have certainly shown that men may live and thrive, for a time at least, on amounts of proteid per day equal to only one-half the amount called for in the Voit standard. Sivén's experiments, in particular, certainly indicate that the human organism can maintain itself in nitrogenous equilibrium with far smaller amounts of proteid in the diet than is ordinarily taught, and further, that this can be attained without unduly increasing the total calories of the food intake."

In the same article from which the above is taken, Professor Chittenden describes some carefully conducted experiments upon a gentleman (Horace Fletcher) whom he refers to as having " for some five years in pursuit of a study of the subject of human nutrition, practiced a certain degree of abstinence in the taking of food and attained important economy with, as he believes, great gain in bodily and mental vigor, and with marked improvement in his general health." Omitting comments and details for which there is not room here, I will again quote Professor Chittenden's own words as to the results of these experiments:

" For a period of thirteen days, in January, he was under observation in the writer's laboratory, his excretions being analyzed daily with a view to ascertaining the exact amount of proteid consumed. The results showed that the average daily amount was 41.25 grams, the body weight (165 pounds) remaining practically constant."

This amount of proteid, which sufficed for the needs of nutrition, was only a little more than one-third of that laid

down by Voit as the standard requirement, or to be exact, 34.9 per cent. of Voit's figures.

In a subsequent experiment the subject, Mr. Fletcher, was required to perform daily in the Yale University Gymnasium the same exercises given to the 'Varsity Crew, which, as described by the director of the gymnasium who supervised this part of the experiment, "are drastic and fatiguing and cannot be done by beginners without soreness and pain resulting." Yet he was not in the least disturbed by them.

The noteworthy points in the results of the second experiments as described by Professor Chittenden are that, though the subject of the experiment fully satisfied his appetite, not having been under any restrictions as to either quality or quantity of the food, and performed a large amount of violent exercise daily during the entire experiment, his consumption of proteid averaged less than 45 grams daily as compared with the 118 grams prescribed by Voit, 125 by Atwater, and 130 by Moleschott for the average proteid ration of a man at moderate labor, while his total intake of food amounted to only 1606 calories or heat units as against the 3000 to 4500 considered necessary in such a case by the same physiologists. Moreover there was no loss of weight during the experiment. Apparently nutrition was completely sustained in every respect.

The subject of the experiments above referred to, Mr. Horace Fletcher, is the author of several books on topics connected with eating, nutrition, etc. His particular hobby is what he calls "overmastication," that is, masticating or insalivating in some way all food whether solid, pultaceous, or liquid, very much more completely than is usual with even the most careful of eaters. He claims that by this means one may not only maintain nutrition on greatly less than the usual food ration, but acquire a pharyngeal or buccal reflex which will unerringly indicate both when each bolus has been properly prepared for swallowing and when enough has been eaten at any meal for the needs of the body. Indeed, he maintains

that after practicing this method for a month or six weeks, it will be difficult for one to swallow any morsel of food until it has been sufficiently masticated and insalivated.

In this fast-eating age the need of more thorough mastication and insalivation is a most important theme upon which to preach a new gospel and Mr. Fletcher cannot dwell upon it too long or too earnestly. However, the results of experiments with him as a subject will not hold good for others unless they patiently learn and practice his method of eating and chewing, and it will require a lot of missionary work to induce the rest of mankind to follow his example. Until then most people will go on eating, or bolting, twice the amount they need, washing much of it down with liquids instead of preparing it as Nature intended, and then calling upon physicians to repair the damages that must inevitably result.

Moreover, experience teaches that we must sometimes allow patients with certain gastric or intestinal affections, though temporarily only, a disproportionately large amount of some animal proteid—in the form preferably of meat pulp, meat juice (fresh), meat powder, or finely hashed beef—because it stimulates the gastric juice and the depressed nervous system more and is very much less liable to fermentation than the carbohydrates. Then there are other reasons why some gastro-intestinal patients may demand for a time a larger proportion of nutriment than would barely suffice for a well person. One is that in them much of the food is destroyed by bacteria.

As a measure of prophylaxis it will be advisable, however, in all cases except in those forms of disease requiring a special modification of the diet, to keep rather closely to the relative proportions of the several classes of foods given in the foregoing tables. When the individual is in health, even though in danger of becoming a dyspeptic because of a faulty inheritance, it is wiser not to advise any form of a one-sided diet, such as one consisting largely of meat or of milk or even exclusively of vegetables, as is frequently done by certain extremists.

The vegetable kingdom, including the legumes, can indeed supply all the food elements required, since dried beans and peas contain an even larger percentage of proteid material than meat; but experience proves that, all things considered, a mixed diet is the best, and conduces to the greatest activity of both mind and body. This is undeniably true, notwithstanding a considerable amount of evidence going to show that a diet consisting of vegetables, fruits, nuts, and the dairy products, excluding the flesh foods, is not only not incompatible with very long life and great vigor, especially of the muscular system, but possibly conduces more to longevity and muscular strength than the usual diet including meat and fish. The proteids supplied by the flesh foods are more easily digested by the average civilized man than are those obtained exclusively from the vegetable kingdom, and they apparently tend more to promote cerebral energy and courage.

It will be quite sufficient if you can succeed in inducing your patients to keep down the proportion of flesh foods to that amount which, added to the proteids in the bread, cereals, and vegetables eaten, will make up the one-fifth part of their total diet held by Voit and others to be the normal requirement of this form of aliment. Even that much will probably be more than they really need. The majority of Americans of the leisure class, and many of the humbler class, eat excessively of meat in addition to large quantities of the rich proteid-bearing cereals and legumes, thus greatly exceeding the above-stated proteid requirements, with the result of overtaxed livers and kidneys as well as sclerotic arteries often before middle life.

LECTURE XVII

GENERAL CONSIDERATIONS CONCERN- ING DIET AND DIETOTHERAPY

No attempt will be made here to enter upon a thorough consideration of the exceedingly complex subject of diet. A vast amount of earnest and conscientious study has been devoted to this special field in recent years, and yet the results have by no means been so far digested and classified as to enable us to speak of dietetics as an established and definite science. Authors themselves differ widely upon fundamental points and the practice of clinicians is unfortunately even yet more diverse. Physicians generally, it is to be feared, are too often repelled from the whole subject, bestowing upon it little or no attention because of this lack of unity among the authorities and the apparent unreliability of the published results of many of the numerous experiments relative to the effects of the different foods upon the bodily functions. Nevertheless sufficient is now known to prove beyond question that by means of appropriate diet, in connection with rest and exercise, much more can be accomplished in many diseases of the digestive organs than is possible of accomplishment through the use of drugs or any other form of therapy alone. We know, for example, that certain gastric affections are a direct or indirect result of eating too much or too fast with insufficient mastication of foods which are not themselves very indigestible, or of eating when, on account of intense mental concentration, recent violent exercise, or a greatly exhausted condition of the nervous system, an insufficient amount of blood can reach the digestive glands. A similar statement is applicable to a number of intestinal troubles.

RELATIVE IMPORTANCE OF DIETETICS—RESTING THE STOMACH

Wegele's Estimate of Dietetics.—A prominent German author some ten years ago wrote a work on diseases of the stomach and bowels, dividing it into two volumes.¹ The first volume is devoted entirely to the dietetic treatment of such affections and includes an appendix made up of culinary recipes. Of the second volume the first part, embracing nearly one-half of the book, is occupied with a consideration of the physical or mechanical methods of treatment such as lavage, irrigation of the bowels, nutrient enemata, massage, electrical applications to the stomach and intestines, baths or other applications of water externally, and finally orthopedic treatment and curative gymnastics. Last of all came some chapters on the medicinal treatment of the diseases in question. Yet in this country a physician runs the risk of being considered eccentric if he does not make drug treatment his first and principal resource in the management of the digestive disorders as well as in all other diseases. Many patients will plainly manifest surprise, not to say disgust, upon being asked to restrict their diet, evidently believing that it ought to be possible to find a physician who could cure them radically by drugs alone, allowing them to go on meanwhile eating and drinking the same things that brought disease upon them. But a very little reflection should convince them that this is a serious mistake.

Diseased Stomachs Need Rest.—When there is acute general disease as in fever, the whole body is rested by the patient being put to bed. When an arm or leg is broken, complete rest of the affected part is secured by putting it into a splint. When the stomach is seriously damaged either by injury or disease, it also imperatively requires rest in order to regain its

¹"Die diätetische Behandlung d. Magen-Darmerkrankungen," and "Die physikalische und medicamentöse Behandlung d. Magen-Darmerkrankungen," von Dr. Carl Wegele, Jena, 1893 and 1895.

normal condition; but it is impossible to give it absolute rest and yet maintain life for any length of time. Fasting is usually safe for a few days, but rarely much longer in the case of invalids. Rectal feeding may often be depended on for a longer period—about three to four weeks. After that, in even the worst cases, food must again be given via the stomach. Partial rest, then, is all we are able to give the digestive system. Some portion of it must be kept at work, even when sick.

Hence the difficulties attendant upon the treatment of the chronically diseased digestive organs. Even though crippled, they cannot have the rest which would allow them to recover speedily. But by means of diet we can do much in the direction of resting them. When the disease is found by the appropriate tests to involve the stomach exclusively or chiefly, while the liver, pancreas, and intestinal glands are normal, we can spare the suffering part very much by prescribing food which will tax both the gastric glands and musculature as little as possible, and pass rapidly on into the duodenum, where it will meet the other digestive juices. In these cases, too, you should insist upon thorough mastication, so as to get all the help possible from the saliva.

When, on the other hand, the stomach is shown to be comparatively healthy and other parts of the digestive apparatus are at fault, you may reverse the process, and give foods which can be digested mainly in the stomach.

When all these parts are involved, as is too often the case, we may still afford partial rest by so controlling the diet as to exclude the most fermentable articles and prevent overburdening of the afflicted organs from an excess of even proper food, or by food which is either naturally tough and indigestible or made so by bad cooking.

Thus it may be seen how important it is, if curative results are to be obtained, to have cases of indigestion systematically examined by the exact methods now at our command, and the diet carefully adapted to them.

Nor can this adaptation be done once for all. Every case

may profitably be studied and the results of the diet and treatment on the urine, feces, blood, body weight, nerve state, etc., closely watched. But with the earnest and conscientious co-operation of the patient and the patient's friends with the efforts of the physician, very much can be accomplished in even many of the most unpromising cases.

Summary of Precautions.—To sum up, the chief points to bear in mind in advising dyspeptics regarding their eating, drinking, etc., are as follows: They should never eat a hearty meal when very tired, vexed, worried, or cold. If they have been exercising severely, they should lie down or rest in some easy position for half an hour before eating. They should eat slowly and simply, combining few things in one meal, and above all masticate thoroughly every morsel taken. They should also endeavor, so far as possible, to dine in pleasant company and to cultivate a cheerful spirit at the meal hours. It is not well for them to exercise either the mind or body actively for at least half an hour, and better an hour, after their principal meals, especially after their dinners. They must learn to use their saliva for the purpose of moistening and partly digesting their farinaceous food instead of washing it down with drinks. Let them keep their feet warm, their heads cool, their kidneys active, and their bowels open, by simple natural methods, such as exercise, drinking freely of water between meals, etc., avoiding drugs for these purposes except when especially ordered by their physician.

Dietetic Faults the Most Frequent Causes of Gastro-Intestinal Disease.—Both gastric and intestinal affections may be due to the prolonged influence of cold and dampness upon the lower extremities, or to habits of indolence which prevent a sufficient use of the muscles, and to infections of various sorts; but it remains true that a considerable proportion of the disorders of all parts of the alimentary canal are dependent upon dietetic imprudences. The amount or quality of the food or drink, or the times or manner in which these are taken, may be unhygienic and injurious. Manifestly disease which has

resulted from such faults in diet is best remedied by curing the faults upon which it depends. To attempt the cure of such disease by administering drugs, by the application of electricity or by hydriatic procedures, without correcting the dietetic error, is naturally to invite failure.

A very large proportion of the various diseases which affect other parts of the human body also are directly or indirectly a consequence of dietetic faults, since the latter inevitably tend to the derangement of digestion and nutrition, and derangements of nutrition in the end may involve every organ and structure in the body without exception.

At different times and by different authorities, all possible forms of dietotherapeutics, from complete fasting to forced feeding have been employed in the treatment of disease. Complete fasting for limited periods is of unquestionable value in certain diseased conditions, especially in the early stages of fevers and acute inflammatory conditions; and the forty-day fasts of Dr. Tanner and others have proved that strong, well-nourished individuals may often submit even to such prolonged abstinence from food without much danger. In the acute inflammations of the gastro-intestinal tract, fasting for from one to three days is generally safe and advantageous, except when the patient is greatly reduced or debilitated, especially when the case is closely watched by the physician and a trained nurse. In most chronic gastro-intestinal maladies, fasting has not been found necessary, though in gastric ulcer the withholding of food by the mouth is now almost universally recommended for a period of one to two weeks, nutriment being meanwhile given per rectum. Exclusive rectal alimentation in acute appendicitis also has been strongly urged in some quarters.

A lady physician once narrated to me that she had been cured of a stubborn and theretofore incurable fermentative dyspepsia by an involuntary fast of two weeks, necessitated by having been shipwrecked and left with the crew and several passengers for that length of time after their supply of food

gave out before relief could be obtained. This physician asserted that thereafter she never suffered from dyspepsia. It seems worth considering whether in intractable cases of this very prevalent affection the withholding of food by the mouth should not be tried for a short time while the patient is nourished, as in the first stage of the treatment of gastric ulcer, by food introduced per rectum.

On the other hand, patients suffering from chronic derangements of digestion should not be subjected for long periods to a dietary which does not fully maintain nutrition. This would further enfeeble them and aggravate the disease. Only a fairly strong and well-nourished patient should ever be permitted to try the fasting cure, and then you should meanwhile feed by nutrient enemas.

The following table, containing the more common foods, will serve you in selecting the proper amounts of the various articles to meet the requirements of nutrition.

THE PROPORTIONS OF THE SEVERAL INGREDIENTS IN THE DIFFERENT FOOD ARTICLES

FOOD MATERIAL Edible Portion	Proteid Per cent.	Fat Per cent.	Carbo- hydrates Per cent.	Salts Per cent.	Fuel Value of one pound in calories
Ribs of beef	15.4	35.6		0.9	1,790
Sirloin steak	18.5	20.5		1.0	1,270
Round "	20.5	10.1		1.2	805
Veal, shoulder	20.2	9.8		1.2	790
Mutton, shoulder	18.1	22.4		0.9	1,280
" breast	14.2	47.2		1.0	2,215
" leg	18.3	19		0.9	1,140
Lamb, shoulder	17.5	20.7		1.0	1,580
" leg	18.9	15.3		1.1	1,000
Chicken	24.4	2		1.4	540
Turkey	23.9	8.7		1.2	810
Hen's egg	14.9	10.5		0.8	720
Ham, Salted and Smoked	16.7	30.1		2.7	1,900
Shad	18.6	9.5		1.3	745
Whitefish	22.1	6.5		1.6	685
Salmon	21.6	13.4		1.4	965
Lake trout	18.2	11.4		1.3	820
Brook trout	19	2.1		1.2	440
Mackerel	18.2	7.1		1.3	640
Bluefish	19	1.2		1.3	405
Butter-fish	17.8	11		1.2	795
Black bass	20.4	1.7		1.2	450

THE PROPORTIONS OF THE SEVERAL INGREDIENTS IN
THE DIFFERENT FOOD ARTICLES—*Continued*

FOOD MATERIAL Edible Portion	Proteid Per cent.	Fat Per cent.	Carbo- hydrates Per cent.	Salts Per cent.	Fuel Value of one pound in calories
Cod, whole	15.8	0.4		1.2	310
Halibut	18.3	5.2		1.1	560
Oysters	6.1	1.2	3.6	2	230
Clams	6.5	0.4	4.2	2.7	215
Lobster	14.6	1.9		1.7	350
Crab	17.8	2		3.1	415
Terrapin	21	3.5		1	540
Green turtle	18.5	0.5		1.2	305
Milk	3.6	4	4.7	0.7	325
Butter	1	85	0.5	3	3,615
Cheese, full cream	28.3	35.5	1.8	4.2	2,070
" skim-milk	38.4	6.8	8.9	4.6	1,165
Potatoes	2.1	0.1	17.9	1	375
Sweet potatoes	1.5	0.4	26	1	530
Red beets	1.5	0.1	8.8	1.1	195
Turnips	1.2	0.2	8.2	1	185
Carrots	1.1	0.4	8.9	1	205
Squash	0.9	0.2	10.1	0.7	215
Cabbage	2.4	0.4	5.3	1.4	155
Cauliflower	1.6	0.8	5	0.8	155
Spinach	2.1	0.5	3.1	1.9	120
Asparagus	1.8	0.2	3.3	0.7	105
Tomatoes	0.8	0.4	2.5	0.3	80
Green peas	4.4	0.5	16.1	0.9	400
String beans	2.2	0.4	9.5	0.7	235
Lima beans	7.1	0.7	22	1.7	570
Green sweet corn	2.8	1.1	14.2	0.7	300
Haricots verts	1.1	0.1	2.6	1.1	70
Baked beans, canned	7.1	3.2	20.3	2.2	645
Apples	0.3	0.4	15.9	0.2	320
Grapes	1.6	1.7	21.3	0.6	500
Banana	1.4	1.4	29.8	1.1	640
Pineapple	0.4	0.3	9.7	0.3	200
Rice	7.4	0.4	79.4	0.4	1,630
Beans, dried	23.1	2	59.2	3.1	1,615
White hominy	8.3	0.4	77.4	0.4	1,620
Oatmeal	14.7	7.1	68.4	2	1,845
Pearl barley	8.4	0.7	78.1	1	1,635
Entire wheat	11.9	1.7	74.6	1.4	1,680
Buckwheat	6.9	1.4	76.1	1	1,605
Buckwheat farina	3.3	0.3	84.8	0.4	1,650
Wheat bread	8.8	1.7	56.3	0.9	1,280
Graham "	9.5	1.4	53.3	1.6	1,225
Rye "	8.4	0.5	59.7	1.4	1,285
Soda crackers	10.3	9.4	70.5	1.8	1,900
Oyster crackers	11.3	4.8	77.5	2.5	1,855
Oatmeal "	10.4	13.7	69.6	1.4	2,065
Graham "	9.8	13.6	69.7	1.9	2,050
Starch . . . . .	..	..	97.8	0.2	1,820
Sugar, granulated . . . . .	..	..	97.8	0.2	1,820
Molasses . . . . .	..	..	73.1	.23	1,360

In ordering a diet, you would best follow pretty nearly at first the tables given in the preceding lecture. Prescribe the different classes of foods in the relative amounts laid down by Voit or Atwater, having regard to the sex and occupation of the patient. Then when the latter has learned to chew all food long and thoroughly, you might try, in well-nourished cases, whether the weight cannot be maintained upon smaller amounts so as to avoid the possible dangers of overfeeding.

The Arrangement of Meals with Relation to Rest and Exercise.—A matter of much practical importance in relation to diet is the arrangement of the times for meals. This might have been appropriately considered in the preceding lecture under Prophylaxis, but its discussion will be equally in place here. In Germany and in some other parts of Europe it is the custom to take a very light repast upon arising, and then at eleven or twelve o'clock to take what is called a second breakfast, which is a more substantial meal. Then a hearty dinner is eaten at from three to six o'clock, varying with the locality and the social position of the person. In most places a supper is taken later in the evening. In the United States the custom as to the number and character of meals varies greatly in different localities and, naturally, with different classes of people. Not a few persons eat two meals a day only, both of them usually substantial ones, at 8 to 9 A. M., and from 4 to 6 P. M., as a rule. A majority of Americans eat three meals daily, beginning with a hearty breakfast at six to eight o'clock, comprising eggs or meat and some form of carbohydrate food with coffee or one of the cereal imitations of it. The wealthier classes, in the East especially, commonly eat a luncheon more or less generous in the middle of the day, and dinner at 6 to 7 P. M. Most farmers, and working people generally, who make up a very large majority of the total population, take a hearty meal, including usually meat, in the middle of the day, and supper, ordinarily a substantial one including meat again, in the evening. A few persons, following the teaching of a Pennsylvania physician, omit breakfast alto-

gether, taking their first meal at from eleven to twelve o'clock, and a second one when the day's work is over, at six or some time thereafter.

Advantages have been claimed for each of these methods of distributing the daily meals. The last-mentioned one possesses marked disadvantages in that the two necessarily rather hearty meals taken for the maintenance of the body during twenty-four hours are eaten so nearly together within a period of six to seven hours. A breakfast delayed until midday must perforce be a generous one, which might well be expected to interfere somewhat with the working power of an individual during what must be for most persons the active afternoon hours. Two meals a day will often suit sedentary persons best, but they should be eight to ten hours apart, and the luncheon or midday dinner is the meal which can be most advantageously omitted.

Whether two meals, or four or five meals, will nourish the system best and with least embarrassment to the other functions besides those engaged in the work of digestion, can doubtless not be settled in the same way for all.

Men and women who work with their muscles usually need at least three meals, and these should be as equally divided as possible throughout the waking hours. The idle and luxurious classes, when in good health, do not, as a rule, actually need more than three meals in the twenty-four hours, and very many of them would do better with two only. When, as usual, their time for retiring is from eleven to one o'clock at night, it is doubtless best that their largest meal—the dinner—should be taken in the early evening. If they are regularly up until midnight or later they may properly enough take a very light additional repast before retiring; but only if it be taken regularly and at the same hour every night. They will naturally, with these habits, breakfast late, rarely earlier than nine o'clock, and if they take any luncheon at all it should be a very small one at 1 or 2 P. M.

These general statements as to customs and the food re-

quirements of persons in health having been premised, it is in place to add a few suggestions of a general character as to how patients with a stomach or bowel disease should arrange their meals. It is necessary to divide such persons into two distinct classes: First, those who, in spite of their ailment, are obliged to continue actively at work; and, second, those who can dispose of their time as is most pleasant or healthful for them. As to the latter, it may be said at once that, as a rule, it is best for them to eat their heartiest meal in the middle of the day, so that it shall be fully digested long before the hour for retiring, which, in their case, should generally be an early one. For many of these well-to-do invalids who have weak digestive power, the best arrangement will be two to three small meals with two or more very light repasts between them, so that the digestive organs may be at no time overburdened. Many a weak stomach will digest easily and quickly quite a small meal, while it would be embarrassed seriously by a large one.

The poor dyspeptic who must remain at his desk or other work eight to ten hours daily, or the wealthy one who insists upon attending to business or devoting himself actively to any pursuit which closely occupies his time during the day, must necessarily have his meals arranged with great care. As a rule, his breakfast should be substantial, and it will often be best for him to take a plain dinner in the middle of the day, provided he can have time enough to eat it without hurrying, and a little rest after it, since his supper can then be a much lighter meal than would otherwise be necessary, and his sleep will likely be much less disturbed and more refreshing. In many instances, however, the digestion is so poor that the patient, for several hours after eating such a mixed meal as a dinner, is incapacitated for any concentrated mental effort, and in the case, therefore, of a person thus afflicted, whose occupation calls for brain work during the afternoon hours, it would be much wiser to take luncheon at midday and as simple a dinner as possible at night. It may easily be seen that the problem

is a somewhat intricate one, and that no hard-and-fast rule can be made which will suit all persons. Here especially the physician must individualize his cases and make his dietetic directions correspond to the needs of each particular case.

Regularity in Times of Eating Essential.—In whatever way the times for meals may be arranged in the case of persons who have either inherited or acquired a delicacy of constitution or tendency to indigestion, the meals must be taken with the utmost possible regularity at the same hours every day. No hygienic rule is more important than this for such persons, and indeed, if they could only be made to believe it, for all persons. Horsemen know that irregularity in the times of feeding their horses will injure them and do not permit any carelessness in this regard on the part of their employees. But certain of our society people seem to consider themselves above all hygienic laws in the matter of eating and drinking, taking their last meal of the day sometimes at 6 to 7 P. M., but on several of the evenings each week consuming indigestible suppers at any hour, from ten to twelve, that may happen to suit best their entertainers or the character of the entertainment. Physicians understand well enough that this is ruinous to the digestion of all but the very strongest, and that even these must inevitably pay the penalty also, only a little later, and in the form of heart or kidney disease or apoplexy, if not in that of indigestion.

For those who find that they can eat anything, at any time without paying the penalty as they go along, no reform, of course, is possible or at least likely; but for the others, among whom are to be included a large proportion of the intellectual classes, the lawyers, clergy, artists, and literary people, many of whom are very social, and some of whom are among the brightest ornaments of society, it does seem as though something might be done. It ought to be possible for this large and very influential class of society to assert itself in some effective way which would protect its members from the well-nigh irresistible temptation to transgress the laws of health—one might

say almost the necessity of eating and drinking unhygienically, if they would not make themselves unpleasantly conspicuous—without obliging them to forego all social enjoyments.

A majority of these intellectual people, who are prone to have indigestion when they transgress health rules, have a tendency to hyperchlorhydria; their gastric glands are easily excited to oversecretion. When such persons are offered tempting viands on a festive occasion at an hour when not only *their* stomachs but those of all the others should be resting, they are frequently amiable enough to make a feint of eating just a little something for the sake of appearances—not to seem to frown in disapproval of what the others are doing. Perhaps they are able to find in the menu some apparently innocent thing like delicate pieces of bread and butter or biscuits, and they resolve just to nibble a little at one of these. The result is such a rapid pouring out of gastric juice as speedily constrains them to go on and eat heartily of whatever can be had, with the result often of a sleepless night and utter unfitness for the next day's duties.

I have often wondered if it would not be feasible for the many agreeable people of this kind who are in society to get together, declare their independence of Dame Fashion so far as regards the late suppers, and flock by themselves at parties when the eating time comes around, or perhaps get up an occasional social affair of their own at which there should be nothing additional to the usual festivities except "a feast of reason and flow of soul." In the meantime, however, you will favor your dyspeptic patients most by making your prohibition of eating out of season, whether the food served be good or bad, as emphatic as possible. The more imperative your commands the easier it will be for them to withstand the temptation placed before them.

LECTURE XVIII

THE DIET IN IRRITATIVE AND ATONIC CONDITIONS

Classification of Diseases with Regard to Dietetic Treatment.—All the conditions of impaired health in which there is indigestion may, for the purpose of dietetic treatment, be divided into two great classes. One comprises the affections in which there is disease in some part of the digestive tract. This may be inflammatory or degenerative, or may merely consist of a persistently increased or diminished functional activity on the part of the muscular apparatus or secreting cells, or both.

The other class includes affections of the nervous, circulatory, respiratory, or genito-urinary system, accompanied by reflex or sympathetic derangements of digestion of a transient or variable character. In the latter class, the digestive organs themselves may be healthy, and the diet to be prescribed then is that appropriate to the disease existing elsewhere. If this be tuberculosis or a true neurasthenia due to overtaxed energies and not to lithæmia, the diet should be generous and may be often relatively rich, or even what would usually be considered indigestible, regardless of the symptoms referred to the gastro-intestinal tract.

It is otherwise with the former class—the diseases involving some part of the digestive apparatus itself. Of these two subdivisions may be made: those with increased, and those with decreased functional activity. Here you will need either to stimulate or soothe, or more frequently still, perhaps, to spare the affected organ by suitable remedies and foods. To spare an organ is to lessen its work in order that Nature may be

better enabled to bring about restorative changes. When you put to bed a patient with typhoid fever, or nervous prostration, all the organs are spared as much of their usual work as possible. By means of diet, just as by medicines or the mechanical methods of treatment, you can either stimulate or depress the functional activity of various structures and by the same means—a proper selection of foods—you can often do that which can seldom be done by any drug, to wit: save or spare a crippled organ, thus affording it at least relative rest, even while the other parts of the body may continue active.

The Diet in Irritative Conditions.—But in all cases with irritative conditions in the digestive organs, especially in the more stubborn cases of excessive HCl secretion (hyperchlorhydria), whether an ulcer is demonstrable or not, you may sometimes cure rapidly by carrying out the accepted treatment for gastric ulcer, which is to place the patient for a time at complete rest in bed, with at first either no food by the mouth or only small amounts of the blandest liquid nutriment in that way, supplementing this by rectal feeding. I have been much impressed by the fact that some of such cases, so long as treated for simple hyperchlorhydria with the usual drugs and diet, but allowed to go about their business or pleasures, prove exceedingly obstinate and yet respond promptly when, after the symptoms have begun to awaken the suspicion of gastric ulcer, the patients have been put to bed with only rectal feeding for a week or two, followed by a strictly liquid diet by the mouth, very gradually increased.

Typical examples of the irritative disorders demanding sedative remedies and a sedative diet, or functional rest, are, in the stomach, round ulcer, hyperchlorhydria, and acid gastric catarrh, and in the intestines, diarrhea, and probably also most cases of spastic constipation, as well as all the forms of enteritis and colitis. Stimulant or irritant foods and food accessories (or indigestible foods, which are irritating in proportion to their lack of digestibility), including many vegetables, especially cabbage, onions, and radishes, acid fruits, most

of the uncooked vegetables and fruits, the spices, and most of the sharper condiments, and the meats in the form usually eaten, are especially likely to aggravate the class of gastro-intestinal diseases which are characterized or accompanied by irritative conditions.

On the other hand, the blandest and least stimulating aliments, such as milk and whey, as well as rice and other farinaceous preparations, when well insalivated by thorough mastication, taken in small quantities at a time, and especially when the starch has been previously dextrinized by prolonged baking, conduce more to the cure of the same diseases. These starch foods should, in all cases of hyperacidity, be taken early in the meal and never at the end of it as in the form of dessert, unless the dextrinization has been very complete; otherwise, no matter how well insalivated such food is, the high acidity of the stomach contents towards the end of the meal stops at once the process of starch conversion.

Meats in HCl Excess.—The meats, however, though known to stimulate secretion more than other foods, are recommended by many authorities in conditions associated with excessive secretion of HCl because they combine or use up more of the surplus acid and thus often seem to lessen the discomfort after meals more than other forms of nourishment, and for the further reason that the starches are theoretically less digestible in such hyperacid conditions. These reasons for adopting a stimulating diet in a disease peculiarly characterized by irritation might be convincing but for the fact that such a diet tends to intensify and perpetuate the underlying morbid state of the secreting cells so that the temporary palliation of the symptoms is dearly bought. Moreover, clinical experience has shown that in these hyperchlorhydric cases starch foods taken at the beginning of small or very moderate meals and thoroughly chewed so as to obtain the full amylolytic effect of the saliva, may generally be made to digest and agree well, especially when, by means of full alkaline medication or sedative intragastric electrization, the irritated condition of the glands

is at the same time overcome as rapidly as possible. Indeed, in the hundreds of cases showing an excess of HCl which have been treated at my offices during the last few years, the gastric contents brought up for testing were nearly always in a perfect solution, even though the analysis indicated that the process of starch conversion had not been carried so far as it normally should be in the stomach.

But, as there are exceptions to all rules, so in these irritative conditions with excessive HCl secretion, you will often encounter cases complicated with much fermentation of the starch and saccharine foods (carbohydrates) and in these it is well to let the diet at first consist largely of the blander nitrogenous foods, such as soft-boiled eggs and the juice pressed out of beefsteak, meat powders, or finely hashed steak with sometimes plenty of fat in some palatable form (since this lessens HCl secretion), and only a minimum of the carbohydrates. The organic acids produced by fermentation, when present in large amounts in the stomach, seem to act as an irritant in marked degree to the secretory structures, and thus in these exceptional cases may increase or even provoke a hypersecretion of HCl as surely as tough, indigestible articles, or stimulating foods, such as meats in the ordinary forms.

HCl doubtless possesses important germicidal properties as against some bacteria, but yeast fungi certainly flourish in its presence, and other organisms that produce fermentation in the stomach in many cases are not inhibited by even a large excess of it to any efficient extent. Thus, while certain general rules apply in the selection of a diet for any given case of gastric or intestinal disease, it is necessary constantly to individualize, to study each case by itself—indeed, on account of idiosyncrasies, it is often needful to study the response of each digestive apparatus to each special article of food which is to be depended upon as a chief part of the nourishment for any considerable time.

The Diet in Atonic Conditions.—Turning now to the opposite class of gastro-intestinal cases, those characterized by

atonic conditions with symptoms of depression—deficient functional activity—as in atrophy, achylia, or hypochlorhydria, chronic asthenic catarrh, and carcinoma of the stomach, gastric motor insufficiency, dilatation of the stomach, chronic atonic constipation, etc., a somewhat different kind of diet needs to be prescribed.

In the atonic cases of gastric and intestinal disease not accompanied by catarrhal inflammation, whether the atony involves chiefly the glandular or muscular structures, the diet should be first of all as digestible and nourishing as possible, and if at the same time it be stimulating, the results in bringing up nutrition will usually be all the better. Animal broths, and even the much condemned beef tea, may prove of service here as being capable of stimulating the appetite and increasing the ability of the various organs to digest more nourishing articles of food. The fermented products of milk, such as kumyss, kefir, matzoon, etc., often suit very well in these conditions; and if the lighter alcoholic beverages, such as claret, Rhine wines, or possibly even port and sherry, are ever to be recommended in gastro-intestinal cases, it should be especially in these atonic forms of them. The fermented liquors, such as beer, ale, porter, brown stout, and the popular liquid malt extracts which are sometimes more carefully brewed, have also a certain tonic, or, at least, stimulant action upon the appetite, besides possessing some diastasic property and a very slight content of real nutriment. In small doses they can undoubtedly be of service temporarily in such atonic cases in which there is not too great a tendency to fermentation; possibly, also, in a limited number of similar cases in which there is considerable fermentation, dependent chiefly upon a lowered tone in the nerve centers presiding over the digestive processes.

In certain affections of the alimentary canal, especially in chronic asthenic catarrh of the stomach or duodenum, with good motor power and with normal pancreatic and hepatic secretion, you may expect favorable results from such stimu-

lating and yet very digestible articles of diet as broths, meat juice, meat powders, especially Mosquera's Beef Meal, and scraped or hashed lean beefsteak, and, in the less severe cases, tender lean meats in the usual forms, especially beef, mutton, lamb or poultry, roasted, broiled, or thoroughly stewed. A predominantly nitrogenous diet which is at the same time easily digested, keeps down fermentation, and will maintain nutrition well enough for short periods—say four to six weeks, notwithstanding that it furnishes temporarily much more proteids than the normal one-fifth part, and much less carbohydrates than the normal, which is from three-fifths to four-sixths of the whole amount. The normal one-tenth part of fats may be supplied, and even much exceeded, with such an anticitarrhal diet, when it is found to agree, but sometimes this proportion of fats will increase fermentation so much as to retard the cure. With this diet, a small amount—three, four, or five slices daily—of moderately stale bread and butter can usually be allowed, and in those cases without HCl excess it need not be toasted or in the form of zwieback, the particles of which are too hard and gritty for easy solution in the stomach. In consequence of which there often result from such food increased flatulence and constipation. Most hard biscuits (crackers) are open to the same objection, beside the danger of having been kept too long.

A free use of water, preferably taken rather hot, is an almost indispensable accompaniment of such a nitrogenous anticitarrhal regimen in order to maintain an efficient elimination through all the excretories, as well as to cleanse away the accumulations of mucus from the affected membranes. When, however, in these or in any other cases, the gastric motility is much impaired as a result of other causes than hyperacidity, the fluids of all kinds must be strictly limited; gastric lavage and flushing of the colon, more efficient methods when prudently managed, must then take the place of the copious water-drinking.

A milk diet is the favorite resource of many routine practi-

tioners in all catarrhal or suspected catarrhal cases, for under the still prevalent guessing methods the diagnosis is very often wrongly made. It suits sometimes admirably, but quite as often fails or aggravates, especially when there is excessive lactic fermentation and in the cases with deficient motor power in the stomach. Eskay's Food or peptonized milk may succeed when plain milk fails, and Plasmon can often be added to the latter with advantage, making a more nourishing but still easily digestible and non-irritating food.

Some such restricted diet is usually advisable in the worst catarrhal inflammations of the alimentary canal, and greatly promotes a cure, though care must be taken that the patient is properly and sufficiently nourished. To persevere long with a very one-sided or deficient diet is to risk impairing nutrition to a serious extent. The patient should be weighed from time to time to see that there is no undue loss of weight, and above all you should keep a close watch upon the urine. Until you have learned to judge from this excretion the state of the metabolism—whether or not the nutrition is being maintained at the proper level—you should not feel yourselves entirely competent to manage complicated cases of gastro-intestinal disease.

The Diet in Diarrhea and Constipation.—This is not the place to discuss at length the diet appropriate to either diarrhea or constipation, and they are fully considered in subsequent lectures; but it may be said in brief here that, while in diarrhea the diet should be as non-irritating, digestible, and nutritious as possible—preferably also usually in rather concentrated form—in constipation, even in the atonic variety, it will not always answer to have it too bulky or irritating. The fruits and cruder vegetables are decidedly contra-indicated in the former; they usually favor more normal evacuations in the latter, and are to be tried hopefully in every uncomplicated case; but when constipation is a result of, or complicated with, a catarrhal process in any portion of the tract, such a coarse, irritating diet will nearly always disagree. It will then

usually either increase the constipation or provoke frequent loose stools with much pain and flatulence—a condition worse than the original disease. One way in which an irritating diet will sometimes aggravate is by provoking an excessive HCl secretion (hyperchlorhydria), which conduces powerfully to the production of constipation. This is most likely to result from an excess of acid fruits in the dietary, especially in nervous, excitable persons with hyperæsthetic mucous membranes. Spastic constipation has not yet been sufficiently studied to speak too positively about it. In this form of the trouble, which yields best to the bromides and other sedative remedies, an irritant diet would *a priori* be expected to disagree, and yet some prominent observers have reported that it often seems to yield to a diet containing much cellulose, as is found particularly in the vegetables and fruits.

Regarding the remaining gastro-intestinal diseases, the ptoses or downward displacements, which are exceedingly prevalent, and the malignant growths in, or adjacent to, the digestive tube, which are comparatively infrequent, the diet should be adapted to whatever associated motor or secretory derangement is predominant, though it must always be as little irritating and as digestible as practicable, and also as nutritious as can be digested, even with the aid of digestants when required. In the case of tumors there is generally in the stomach deficient motility, with greatly decreased secretion of gastric juice and the development of catarrhal inflammation; in the intestines, when these are encroached upon, a lowered motility and secretion of the normal juices, with usually constipation at first, but later most frequently an excessive mucous secretion with diarrhea, or sometimes constipation alternating with diarrhea.

Diet can do little for the exceedingly prevalent displacements of the abdominal organs, but must be suited carefully to the resulting visceral diseases.

Proper Cooking and Thorough Mastication.—In all gastro-intestinal affections, except in uncomplicated atonic constipation, the food is likely to agree best if easily digestible and not

too fermentable; also if finely divided and properly cooked, which means, in the case of eggs, to a very slight extent only, in that of meat, until the tougher parts are softened, but never till they are dried up, and in the case of starch foods as thoroughly as possible, until the hard shell of cellulose which surrounds each particle of starch has burst, so that the starch itself can be acted upon.

A point of the greatest importance, too, is that starch food, particularly, should not only be cooked long and thoroughly, but after that be masticated as completely as possible. This is indispensable for many reasons: which, though they have been referred to at some length in a previous lecture, cannot be emphasized too strongly and therefore are here briefly summarized: (1) It tends to prevent overeating; (2) it insures a more perfect comminution of the food; (3) it greatly increases the secretion of saliva, which at the same time converts the starch into soluble forms (dextrine, dextrose, etc.), and then dissolves it—*i. e.*, it digests it—and it cannot otherwise be digested before reaching the duodenum; (4) both the act of chewing and the alkaline saliva, thus supplied in larger amount to the stomach, increase the secretion of the gastric juice; and (5) the prolonged movements of mastication probably also assist reflexly in stimulating the secretion of the pancreas and intestinal glands as well as the peristaltic movements of the gastric and intestinal muscles.

Dangers in Overrestriction of the Diet.—One more general rule should be insisted upon in regard to the dietetic treatment of indigestion cases: Do not restrict the diet in pure nervous dyspepsia when there is no considerable derangement of either secretion or motility in the digestive organs; and even when these are demonstrably involved do not restrict the diet too severely or in too sweeping a manner unless for serious reasons and for a short time. While a scientifically arranged diet in a case under the immediate observation of an expert physician can often almost alone work wonders and sometimes cure magically cases that had resisted other treatment, it is

better to let the average invalid "eat everything" even, than to send him away to be beyond the reach of his physician for weeks or months at a time, with a very narrow, meager dietary, containing mostly articles which he does not like and cannot eat with any relish. For in such cases the patient, in spite of our science, will often go hungry and grow thin and weak. Moreover, hyperchlorhydria under such conditions will sometimes change suddenly into hypochlorhydria, and the regimen which suited perfectly at first may end by producing a dangerous aggravation.

Diet in the Uratic Diathesis.—Closely related to disorders of the gastro-intestinal tract is the so-called uric acid or uratic diathesis, and in the treatment of this, diet is all-important. Without attempting here to go into this large and much-mooted subject fully, I may be permitted briefly to express a very positive conviction, based upon a considerable experience, that to cure the condition, besides insuring plenty of exercise, active or passive, and complete elimination through all the emunctories, it is necessary greatly to lessen the habitual ingestion of flesh foods, and to prohibit altogether the eating of the glandular portions of animals, such as liver, sweetbreads, calves' brains, kidneys, etc. In the worst cases, forbid also the use of meat soups or meat extracts, as well as coffee and tea, since the former contain a very large proportion of the objectionable uratic products, and the latter contain alkaloïds almost identical with the xanthin bases, which are now believed by most of the authorities to be the chief offending substance among those of the uric acid series.

Sugar also often has to be restricted in such cases, for the reason that it is not exceedingly fermentable, but so much more readily oxidizable than the proteids, that when much of it is taken with the latter, the oxygenation is insufficient; a portion of the proteid matter ingested is left unoxidized with a resulting increase of the injurious products of suboxidation—to wit: the xanthin or purin bases, together with other injurious substances, both known and unknown.

LECTURE XIX

SUGAR, SPICES, ETC., IN GASTRO-INTESTINAL CASES

The Most Difficult Point in a Difficult Subject.—The place of sugar in the diet of gastro-intestinal cases calls for special consideration. It is one of the most difficult points in the whole subject of dietetics, which itself comprises perhaps the most difficult, complicated, and, as yet, unsettled part of practical medicine. Sugar is essential to nutrition. The carbohydrate element in a natural dietary needs to comprise about three-fifths of all the nutriment taken, and must be converted into dextrose, a form of sugar, before being capable of assimilation in the body. Its oxidation produces most of the heat and force which are essential to the vital processes. Yet when eaten daily with the heartier meals it disagrees with most dyspeptics. In conditions in which HCl is secreted excessively by the gastric glands, sugar has been demonstrated to have the property of lessening the excessive secretion. Moreover, in these hyperchlorhydric cases the amylolytic or starch-converting action of the saliva is usually much interfered with by the too rapid acidification of the gastric contents, so that in such cases, especially, I have often observed a peculiar sugar hunger, indicating that the system is not getting as much of this food element as it requires. In so far, therefore, sugar should prove useful in the forms of indigestion accompanied by an excess of HCl. Another point of importance also is the fact that solutions of sugar are among the few things that can be absorbed rapidly from the stomach itself without first passing through the pylorus into the intestines, thus furnishing

with unusual promptness energy to the tired or debilitated body. Yet, when acting upon the suggestions of some recent writers, I have attempted to feed sugar freely to hyperchlorhydric patients they, while usually reporting an improved feeling of well-being during the first few days of the diet, later have almost uniformly shown serious embarrassment as the result of hepatic derangement, increased flatulence with consequent insomnia, and sometimes embarrassed cardiac action.

How, then, can we solve the difficulty and furnish more sugar to these hyperchlorhydric, and to other even more debilitated, patients who are in need of this valuable nutriment? It has been suggested by some writers that the sugar of milk or fruit sugar (levulose) might advantageously be substituted for the ordinary cane sugar in the case of such patients as are here referred to. These are doubtless somewhat less fermentable than the ordinary commercial sugar, but are very expensive and, therefore, not very practicable for use as foods. Besides, even though less fermentable than other sugar, they are still enough so to produce often serious distress when eaten at all freely, in the usual way, along with other food.

An Experiment worth Trying.—I have experimented somewhat in this line with results which are at least interesting and suggestive, if not yet conclusive. I have noticed that the first meal or two in which sugar has been largely given may agree perfectly well, especially if no strong proteid food, such as meat or eggs or indigestible vegetables, have been taken at the same meal. For example, a patient, who had found previously that to top off a dinner with ice cream, cake, or pudding would invariably produce aggravated flatulency, has reported that when an occasional light luncheon or supper has been eaten consisting of such a carbohydrate combination as cake and ice cream and a few chocolate caramels, which are usually additionally indigestible for most dyspeptics because of the large proportion of oil in the chocolate, no increased flatulence or other unpleasant results have followed. If these experiments should be confirmed by a more extended trial of

such a method of feeding, it may be possible to let certain of our dyspeptic patients have, say twice or thrice a week, one light meal of the kind described—that is, made up chiefly of sugar combined with thoroughly cooked starch in a form capable of being chewed, as in cake, or with cream or milk as in ice cream, junket, or other palatable combination of these food articles or, possibly, in the milder cases, some of the nourishing sweet confections compounded of sugar and nuts, though these last would be much more risky. Such a grateful and valuable addition to the diet of many dyspeptics, even at long intervals, would greatly lessen the sense of deprivation of which they complain when denied sweets altogether and at the same time help much to increase their weight and nutrition. Moreover, if the experiment should fail, the disagreement of the sweet combination taken by itself would convince the patient that such foods must be avoided altogether.

Why the Sweets often Disagree after a Dinner.—The reason why sugar may sometimes be made to agree when taken in the manner above indicated, even though it markedly disagrees when ingested as a part of one or more large meals every day, is not far to seek. (1) The usual sweet dessert taken after dinner is nearly always simply so much surplusage; that is, it is additional food taken because of its palate-tickling qualities after a sufficiency of other food had already been taken, and often after the stomach had been greatly overloaded with the substantials of the meal. (2) Most persons, in cities especially, do not take enough physical exercise to insure the complete oxidation of all the food eaten by them, and it is a well-known fact that sugar, being much more easily oxidizable than meat and vegetables, will, when taken with the latter, be oxidized first, thus leaving the more difficultly oxidized proteids to remain in the system in suboxidized forms, including especially the various xanthin or purin bases; and these, when in excess, exert a markedly toxic action upon various important structures of the body. (3) The liver and other organs which perform the function of converting sugar into

glycogen, storing it up and again distributing it to the system as required, are readily overtaxed in many hyperchlorhydrics, so that a moderate meal including considerable sugar might be well tolerated when taken two or three times a week, and the patient gain largely thereby; while sugar, taken once or twice a day, as is the custom of many Americans, might seriously derange the metabolism.

It ought, however, to be borne in mind that such a trial of sweets in any marked case of dyspepsia, particularly when the liver is at the same time much diseased or even functionally impaired, needs to be made with great caution. The patient in every instance should be given to understand clearly that it is only an experiment which may fail with the result of temporarily aggravating the malady; and that if it succeeds, any attempt to repeat the experiment daily, especially to vary it by taking the sweets along with hearty meals, would be likely to prove disastrous. The patients who should respond best to this method of feeding sugar are those who usually are most in need of it, to wit, those suffering from a large excess of HCl in the gastric juice; but it will not agree with all of even these.

THE SPICES, CONDIMENTS, AND BEVERAGES

The Spices, etc., Drugs, not Foods.—Under the head of “Prophylaxis, Food Requirements, etc.,” I have considered these classes of articles with sufficient fullness in so far as regards their use in health. I told you that they are drugs, and not foods in any sense of the latter word; yet like other drugs they are sometimes of use temporarily in disease. The results of experiments have been contradictory as to their effect upon secretion at first, but all agree that in the end they lower it. Lately it has been shown that some of the spices by their primary action stimulate the motor function of the stomach, but finally depress it, just as depression ultimately results after all forms of stimulation. Temporarily, therefore, the spices may be useful as an addition to the diets of

dyspeptics having a poor gastric motility, provided they are employed merely as a palliative while more efficient measures are being carried out with a view to a definite cure of the fault, and are withdrawn after this object has been achieved.

But there is no reason to believe that any harm can follow such a slight seasoning of foods as may be necessary to impart to them for unspoiled palates an agreeable flavor, and salt being a necessary constituent of the body, the taste for it is natural—one to be satisfied.

The subject of the choice of a suitable beverage to drink with or after meals, in cases of gastro-intestinal disease, requires consideration.

The alcoholic liquors have effects which make them undesirable in most such diseases—their prolonged use in all of them. Small amounts of dilute solutions of spirits are perhaps the safest when a stimulant is needed, but even they are contra-indicated in cases of excessive secretion, while the livers of dyspeptics, in which a cirrhotic process, according to Boix,¹ has already begun, are endangered by their use for long periods, to say nothing of their cumulative injurious effect upon hearts and arteries in which degenerative processes have been initiated.

The wines and fermented liquors have injurious properties of their own dependent upon the irritant influence of the acids which they always contain, in addition to those of the alcohol. Concerning the effect of the latter in the more severe gastric affections many leading gastrologists even in Germany (where the drinking of beer is almost universal among all classes) advise against them as a general rule. Boas, *c. g.*, says:² "When there is much mucus in the stomach patients must renounce alcohol and tobacco."

Professor Riegel of Giessen, after summarizing the rather

¹ "The Liver of Dyspeptics," by Dr. E. Boix, G. P. Putnam's Sons, New York, 1887.

² "Diagnostik u. Therapie d. Magenkrankheiten," II Theil, Leipzig, 1895, p. 27.

contradictory results of investigators in this field, is equally emphatic, saying:¹ "In general, therefore, we may say that in diseases of the stomach we can get along very well without alcohol. In all conditions in which the stomach is irritable, as in ulcer, acute and chronic diseases of the stomach with increased secretion of gastric juice, alcohol is to be condemned." Then, after admitting that there are atonic conditions in which a glass of wine may seem to do good, Riegel goes on to say as to the national drink:

"Beer is hardly to be recommended in diseases of the stomach. The relatively large quantity of fluid taken distends the stomach and dilutes the gastric juice, so that, for this reason alone, beer is not a proper article of diet for many stomach cases." Then after referring to the fermentation-exciting action of beer as another objection to it, he concedes its harmlessness in small doses for certain classes of cases, instancing here "simple hyperacidity," which the sour American beers usually aggravate decidedly, and sums up the matter thus:

"Beer is contra-indicated in all cases afflicted with atony of the stomach with ectasia, with ulcer, and with hypersecretion. All strong spirituous liquors, particularly drinks prepared with spices, are to be forbidden in stomach diseases. Champagne, too, must be considered a beverage that is in general unsuited for diseases of the stomach. *It will be seen from all that has been said, that in general alcohol should be stricken from the diet list of a sufferer from any disease of the stomach; only in very rare cases will its administration be advantageous.*"

Coffee and tea in this country, where alcoholic stimulants are not largely used at meals, are the most universal table beverages. Though very much less has been written and spoken against these popular accompaniments of our food, quite as little can be said in their favor on scientific grounds; they are capable of doing nearly as much harm in gastro-

¹ Nothnagel's "Practice, Diseases of the Stomach," Philadelphia, Saunders & Co., 1903, p. 219.

intestinal affections when used at all freely, and especially if taken strong.

Riegel¹ considers tea safer than coffee for dyspeptics, yet my earliest recollections of medical practice include experiences with indigestion cases in Dr. R. G. Curtin's dispensary service at the University Hospital in Philadelphia, when that clever clinician was accustomed often to make an offhand diagnosis of "tea dyspepsia" in servant girls the moment they entered the room, from a certain peculiar, anxious, drawn expression of the face.

Schultz, in a series of experiments reported in the *Zeitschrift für physiologische Chemie* a number of years ago,² found:

1. Under the conditions of the experiment 94 per cent. of albuminous digestion when neither tea nor coffee was added to the digesting mixture.
2. On the addition of tea the amount of digestion was only 66 per cent.
3. When coffee was added the amount of digestion was 66 per cent.

You may as well be told plainly that none of the stimulating beverages are well-suited to dyspeptics unless very dilute and in the smallest quantities.

Stimulants are no more nor less than drugs in spite of the fondness of many of us for word-juggling concerning them, and drugs, however useful now and then for short periods under medical direction, are not advisable as constant and perpetual additions to the diet of any sick persons, even though they may be tolerated for considerable periods by well persons.

Water, Milk, etc.—Water is the basis of all beverages and constitutes 90 to 95 per cent. of most of them. If it must be flavored let it be with something as little medicinal as possible, such as the burnt grains of some one of the cereals or in certain cases a very small amount of lemon juice, or good fresh milk.

¹ *Ibid.*, p. 221.

² "Eating and Drinking," by Albert H. Hoy, M. D., Chicago, A. C. McClurg & Co., 1896, p. 193.

Milk itself, however, does not by any means suit all dyspeptics, being very liable to ferment in some stomachs and intestines with the production of irritating organic acids, gases, etc., besides having a tendency to constipate most persons. Moreover milk is a decidedly nourishing food which, when ingested, needs to be taken slowly, so that it can be digested, and not poured down hastily as beverages are likely to be. Every adult man needs five to six pints of water daily to do the solvent work of the system, and the more pure and dilute the form in which most of it is taken, the better.

While, as just stated, five to six pints of water are required daily by the average adult, the amount can be somewhat less in the case of a person who is prevented by illness from actively exercising: and for gastro-intestinal cases it will make much difference how and when you direct it to be taken. In marked hyperchlorhydria it will be required to be drunk freely during and after meals to dilute the overacid gastric juice, and this practice will then facilitate, not delay, the emptying of the stomach. It is then best taken rather cool or cold, but not ice cold.

In constipation a liberal drinking of water will assist in securing regular evacuations of the bowels, and in these cases it will often be more effective if taken hot, except when, as will often happen, both HCl excess and constipation are associated in the same case.

In atonic forms of stomach trouble there should be little drinking at or near meals. Most of the fluid required should then be taken between meals. In aggravated or extensive gastric dilatation most of the fluids, as well as some, or even all, of the food and medicine, for a time may need to be given per rectum to avoid overdistending the stomach.

In nervous forms of indigestion not dependent upon any gastric or intestinal disease the patient's inclinations regarding water-drinking may be allowed to guide, except that excessive ice-water-drinking should be forbidden.

LECTURE XX

THE AUTHOR'S AND OTHER PROGRESSIVE SERIES OF DIETS

FOR the very prevalent cases of impaired digestion, especially from catarrhal disease, persistently excessive or deficient secretion, weak motor power, etc., there is often much advantage in having at hand a progressive series of diets to be modified as each case may require. I offer the following, which may be useful to you if not prescribed in a routine way without discrimination:

DIET No. 1.—Take every two hours from a wineglassful to a gobletful of peptonized milk, matzoon, or whey, or milk prepared with Eskay's Food according to directions; or a teacupful of clam broth, chicken broth, beef tea, or any meat broth slightly seasoned and with the fat all skimmed off; or the same quantity of rice water, barley water, toast water, gum-arabic water or egg water may be given as an alternative nutriment. When there is obstinate vomiting, a tablespoonful of any of the above may be given every fifteen minutes till the stomach has been settled; or withhold all food by the mouth and feed by enemas till the vomiting has been controlled.

DIET No. 2.—Take every two to three hours the juice from a quarter to a half-pound of lightly broiled lean beef expressed by a meat press or lemon squeezer; or the meat may be chewed by the patient and the juice swallowed while the fiber is rejected. Two tablespoonfuls of Bovinine or an equivalent amount of any good beef extract may be added to a glass in

which the whites of one or two eggs have been beaten up, mixed with two to four ounces of water and flavored to suit the taste. This may be taken every two to three hours instead of the beef juice part of the time, as an alternative food, in some low conditions; but no beef extract equals fresh beef juice in nutritive value.

DIET No. 3.—Take every two hours one to two goblets of good fresh milk, with a tablespoonful of limewater or a pinch of salt in it, or prepared with Eskay's Food according to directions. It should be sipped slowly and may be preceded by the thorough mastication of half a slice of stale white wheaten bread, preferably well toasted, or the same quantity of unsweetened zwieback, but neither of these should be very hard; or by two or three Bent & Co.'s water crackers, or Educator crackers may be taken with the milk; provided great care be taken to see that the crackers are fresh. Thin rice or barley gruel may in certain cases be mixed with the milk in the proportion of one-third gruel to two-thirds milk. No other food as a rule should be taken while on this diet.

DIET No. 4.—At any of the three usual meals a few of the following foods may be selected:

Broiled lean beefsteak, lamb, or mutton chop,—any of these scraped so as to obtain the pulp and juice, avoiding the fiber and fat; finely chopped lean beef made into little cakes after the removal of all the fat and gristle and then broiled over the coals; eggs soft-boiled or poached; stale wheaten bread (the best home-made bread is preferable), which may be lightly toasted, and a very little butter may be eaten on it; good fresh gluten wafers; zwieback, unsweetened; a little finely ground spinach or string beans well cooked, baked or mashed white potatoes, or finely ground boiled spinach.

At the end of each meal a cup of hot water, an infusion of cocoa shells, or of any good cereal preparation intended to imitate the flavor of coffee.

If hungry at 11 A. M. or at 4 P. M., take one or two raw eggs well beaten and mixed with water, with the addition of beef extract if desired; or instead, stale bread and butter or toast or zwieback may be taken with a glass of hot water flavored, if desired, with lemon juice.

Except in the cases in which the proper tests have shown weak motor power in the stomach walls, the patient may drink freely, though not more than a single gobletful at a time, of Poland Spring, Bethesda, Clysmic, Buffalo Lithia or Apollinaris water, or any good pure water as little impregnated with mineral ingredients as possible, but not any of the stronger alkaline waters unless especially prescribed by the physician. Rain water or any pure soft water will answer the purpose well, if boiled to destroy all germs and afterward cooled down and recharged with air to give it life by shaking it a few minutes in a bottle which is not entirely filled.

FOODS AND DRINKS TO BE AVOIDED WHILE ON DIET No. 4.—All articles not especially mentioned as permissible, and particularly all foods made or served with sugar, shellfish, fried things, muffins, fresh or hot rolls, soda biscuits, flannel cakes, etc.; bread not at least one day old; fruits; vegetables except as above mentioned; nuts, raisins, candies, pastries, ices, cakes, puddings, twice-cooked or warmed-over meats, cheese as a rule to which there are exceptions, sausages and scrapple as well as pickles and other very sour things, and all hot or sharp condiments, spices, etc., and alcoholic beverages except as specially permitted. Vichy and the other strong alkaline waters should be avoided, except when prescribed for hyperacidity as shown by a chemical analysis of the stomach contents.

DIET No. 5.—Selection may be made from any articles in the previous lists and from any in this table. None of these foods should be made or served with sugar with the special exceptions mentioned.

Soups.—Any plain, simple soup not too rich or greasy.

Fish.—Raw oysters in their season, but no other shellfish; any other kind of edible fish properly cooked except eel, salmon, herring, and salted mackerel, which are exceptionally oily; and shad should be eaten sparingly if at all.

Meats.—Very tender, broiled, lean beefsteak, lamb chop, venison, antelope meat, hare or rabbit, chicken, squab, quail, or any edible bird, except duck or goose; also, in moderation, ham well boiled and afterward baked; broiled or stewed sweet-breads, except in case of lithæmics; any of the following roasts, if the fat and gristle are carefully rejected: beef, lamb, mutton, chicken, and sparingly of turkey, but not the dressing of any roast fowl or meat.

Eggs.—In all forms except fried; omelets, if baked and not fried; eggs in baked custards and light puddings, if not prepared with sugar. Saccharin may be used instead.

Farinaceous.—Wheaten bread at least one day old, and better two days old; toast or unsweetened zwieback; gluten wafers, plain water crackers, salt crackers or saltine, or Bent & Co.'s, or Educator crackers, if they are certainly fresh. This form of bakery products is very liable to become stale before sold, and then may produce much flatulence. Good bread a day or two old often agrees better; corn bread made without sugar and with only the smallest amount of shortening, best in the form of the Southern hoe-cake or pone. Any of these breads may be lightly buttered. All the mushes (which are usually swallowed without chewing or admixture of the saliva) are purposely omitted from this list; but the thoroughly dextrinized breakfast foods, such as Force, Grape Nuts, and Shredded Wheat Biscuits, may agree well when eaten dry and even when taken with milk (less certainly with cream) are much better tolerated by dyspeptics than oatmeal, cracked wheat, etc. Boiled rice also is one of the most digestible of the cereals.

Vegetables.—White potatoes, baked in their skins or boiled and mashed with milk instead of butter; stewed celery; finely ground spinach; boiled and finely mashed carrots or parsnips,

but not cooked with butter; string beans; young and very tender peas; and, merely as a relish, a leaf or two of lettuce or small piece of uncooked celery, served with salt, but no vinegar. Also any vegetable purée.

Dessert.—A sweet orange, a baked sweet apple, or a few white grapes, and occasionally, when found to agree, after cautious trial, a fully ripe peach or pear; also sparingly of stewed fruits, if but slightly sweetened; after a luncheon or very light dinner, one egg made into a baked custard with milk, but without sugar. If sweetened with saccharin and flavored with vanilla, lemon, or sherry, this makes a delicious dessert. Also curds and whey without sugar; very sparingly of Iceland moss jelly or of guava or other fruit jelly; a small portion of malted milk or of Horlick's or Mellin's Food served with fresh cream; but these jellies and malted foods are all too sweet to agree with many doubtful stomachs, especially at the end of a hearty meal.

Drinks.—Any of those mentioned in No. 4, or a glass of Apollinaris, Poland, Bethesda, Clysmic, or Buffalo Lithia water may be taken at the end of the meal; and also one cup of chocolate or cocoa if taken without sugar, or very slightly sweetened. Water may be drunk freely between meals, except in the cases of dilated stomachs, or of those in which the motility or propulsive power has been found deficient.

AVOID WHILE ON DIET No. 5.—All foods or drinks not allowed on the above or previous lists. Nuts, raisins, candies, shellfish, pastry, tarts, rich cakes or puddings, or other desserts, except those above named as permissible, raw fruit and vegetables, except as above allowed, twice-cooked or warmed-over meats, cheese, sausage, and scrapple, vinegar, sharp or hot sauces and condiments, alcoholic drinks, strong tea or coffee, and sweetened chocolate or cocoa, as a rule, to which there may be exceptions.

DIET No. 6.—May take in addition to the articles mentioned in the previous lists:

Soups.—Small quantity of any kind not too rich or greasy.

Fish.—Oysters in their season in any form except fried; no other shellfish, but any of the other edible kinds not fried.

Meats.—Any kind of cooked meats other than those fried except corned beef, salt pork, very young veal, and “high” game. Duck, goose, and turkey should be eaten sparingly, if at all, by persons whose digestion is doubtful, and the dressing should be avoided by them entirely. Boiled meats are far less digestible than those roasted or broiled, as well as less nutritious.

Eggs.—In any form except fried hard or combined with sugar in rich desserts.

Grains or Cereal Foods.—The drier forms, such as stale bread, toast, and crackers, which require to be chewed, are always best; also corn bread, rye bread, brown wheaten bread, and rolls; but a moderate amount of the mushes may be taken by patients whose intestinal digestion has been restored nearly to the normal. The best of them are Force, Grape Nuts, Shredded Wheat Biscuits, Wheatena, rice flakes, maize flakes, thoroughly boiled rice, the finest grades of cracked wheat, if cooked overnight in a double kettle, and the finest well-bolted kinds of oatmeal cooked in the same way. They should be eaten with a small amount of fresh cream or milk and mixed well with the saliva. Butter may be taken with the bread, except at dinner, when it is better omitted.

Vegetables.—Any of the following, well cooked: asparagus, beets, Brussels sprouts, beans in purée, or very thoroughly boiled and afterward baked till brown; cauliflower, carrots, celery, dandelion, egg-plant, mushrooms, onions, parsnips, tender young peas, parsley, potatoes, not fried unless in the form of Saratoga chips shaved very thin, pumpkins, spinach, string beans, summer squash, sweet corn (if young and very tender), tomatoes, turnips, turnip tops, and vegetable oysters.

The following uncooked vegetables may be partaken of sparingly, merely as a relish, since they are difficult of digestion

for many persons, and have small food value: lettuce, olives, raw celery, and cole slaw.

Dessert.—Oranges, baked apples, ripe peaches, pears, grapes, bananas, melons, light simple puddings, custards, sparingly of jellies, and very sparingly indeed of nuts. Ice cream and water ice are borne fairly well by many not robust stomachs, if taken as part of a light lunch, yet often disagree when taken at the end of a dinner. If eaten after dinner, it should be very slowly and in small amounts.

Drinks.—Cocoa or chocolate; very moderately of coffee or tea not too strong, though one is better without these in the long run. The lighter wines may be taken by those accustomed to them, except where there is a tendency to hyperacidity. The malt liquors are better avoided as beverages by even convalescents from gastro-intestinal diseases. In subacidity, when there are indications for a stimulant with a diastasic preparation, a good liquid malt extract in wineglassful doses may be allowed; but not as a rule the beers, ales, etc., in the usual amounts. In cases where a stimulant is really indicated, a very small portion of whisky in water is often safer.

AVOID WHILE ON DIET No. 6.—Very rich, very sweet or complicated dishes; articles fried in fat; soda biscuits and all hot or even fresh breads as a general rule; most kinds of shellfish, except oysters in their season; pastries, ices after a full meal; sausage, scrapple, and warmed-over meats; very strong coffee or tea, and large quantities of any coffee or tea; alcoholic beverages, except under the conditions and restrictions above mentioned. The sharper condiments, such as pepper, mustard, and the hot sauces should be either avoided or taken very sparingly.

Classes of Cases for which the Foregoing Diet Lists are Indicated.—Nos. 1 and 2 are suited to acute and subacute gastritis or cases of irritable stomach from whatever cause. Aided by appropriate medicines and other accessory measures, such a regimen should be speedily effectual, and not need, as a rule, to be continued beyond a few days.

The articles prescribed in No. 3 usually agree well with cases of subacute gastric catarrh and with certain forms of chronic gastric catarrh; also, with acute nephritis and any of the other conditions for which a milk diet may be indicated. It answers for the severest cases of hyperchlorhydria and for gastric ulcer after a preliminary period of rectal feeding. Out of the first three tables can be formed a good regimen for advanced cases of gastric cancer, but for many such cases some of the things in No. 4 would need to be added.

No. 4 is adapted to a large proportion of the cases of chronic catarrh of the stomach (gastritis chronica) of pronounced type in the stage in which they are usually first seen by the specialist, as well as to many cases of chronic intestinal catarrh.

No. 5 is intended especially for the same classes of diseases when somewhat further advanced toward a cure. Nos. 4 and 5 may be suited to the treatment of numerous chronic affections in which a simple and easily digestible and yet highly nutritious diet is required.

No. 6 is too liberal to be entirely safe for most dyspeptics even when convalescent, but it serves the very useful purpose of encouraging them to look forward to it as comparatively a feast of good things to which they may hope to attain later on, and at all events it is a simpler and safer diet than that to which most of them are accustomed, and than that to which they would promptly return upon being pronounced convalescent, unless peremptorily limited to a less harmful one by their physician. It can easily be cut down to the exact needs of any particular case. It can be modified also by simply striking out unsuitable articles so as to answer for diabetes, obesity, lithæmia, and numerous other diseases.

For catarrhal inflammations involving both the stomach and intestines, the lists 1 to 4 may be employed, the more restricted ones for acute or severe cases, and No. 4, or even No. 5, for the chronic ones and those progressing toward recovery. When the catarrhal inflammation is confined wholly or mainly

to the intestinal mucous membrane, the gastric juice being active and the stomach in good condition, the dietetic treatment by lean meat and hot water with the addition of stale bread or toast and a few relishes, often suits remarkably well if not persisted in too long. Such a plan of diet can easily be adapted from No. 4 or No. 5 by striking off the vegetables and other articles not required. Aberrations from the normal in the amount or character of the gastric juice—whether they constitute hyperchlorhydria or hypochlorhydria, hyperpepsia or hypopepsia—demand special dietetic treatment which can be readily met by modifications or combinations of these tables.

Special diet directions for gastric ulcer, hyperchlorhydria and other important diseases are given further on under their respective heads

DIET DIRECTIONS OF LEUBE AND PENZOLDT

It should be of interest to you to know how leading German clinicians and specialists in digestive diseases direct their patients as to diet. Leube instituted a series of experiments upon persons with impaired digestion, to determine the length of time that the principal food substances and preparations required to digest and pass out of the stomach in such cases. He constructed diet tables for gastric ulcer and other serious diseases of the stomach based upon such experiments, and so arranged as to progress from a list of the simplest and most easily digested articles up to one containing numerous decidedly strong and nourishing foods which require more time and digestive power.¹ I append here, in the form summarized by Riegel,

LEUBE'S DIET SCHEME

DIET I.—If the digestion is very much reduced, the following articles of food are most easily digested; bouillon, meat solutions, milk, raw or soft-boiled or poached eggs.

DIET II.—Less digestible than Diet I are the following

¹ Nothnagel's "Practice, Dis. of the Stomach," by Franz Riegel, Professor, etc., Philadelphia, 1903.

articles of food: boiled calves' brain, boiled thymus, boiled chicken and pigeon. These different kinds of meat are enumerated in the order of their digestibility. Other articles of food that are permissible are gruels, and in the evening milk mushes made with tapioca and white of egg. The majority of patients can assimilate boiled calves' feet in addition to the articles of meat mentioned.

DIET III.—If Diet II can be digested, Diet III follows. The increase consists in adding cooked or raw beef to the above diet list. Leube mentions the following method of preparing beefsteak, and claims that beef cooked in this way is very easily digestible. The meat should be allowed to lie for some time and scraped with a dull spoon; in this way a meat-pulp is obtained consisting only of the delicate parts of the muscle, and containing none of the tough, hard, and sinewy portions. These meat-scrapings are roasted in fresh butter. Raw ham is also permissible in this stage.

In addition to meat, a little mashed potato may be given, some white bread that is not too fresh, and possibly small quantities of coffee or tea with milk.

DIET IV.—Roast chicken, roast pigeon, venison, partridge, roast beef, medium to raw (particularly cold), veal (from the leg), pickerel, boiled shad (even young ones are hard to digest), macaroni, bouillon with rice. Small quantities of wine to be taken one to two hours before eating; gravies are contra-indicated. Young and finely chopped spinach is the best vegetable; other vegetables, as asparagus, may be tried, although Leube considers this a risky procedure. The patients are allowed to take a more liberal diet after this fourth diet, but the increase should be very gradual. They should refrain from eating vegetables, salads, and preserves, and fruits for a long time. The first of these articles that they may eat is a baked apple.

Penzoldt afterward repeated Leube's experiments upon healthy persons and improved upon the latter's diet tables, considerably enlarging and extending them. He constructed a

series of four diet lists founded upon similar data, including the time each kind of food remained in the normal stomach, and added directions as to how each article should be cooked and eaten, as well as the quantity to be taken at a time. Penzoldt's four lists are designed to train the weakened digestive apparatus gradually and progressively up to the full performance of its work. Numerous authors have republished Penzoldt's diet tables, and they are generally accepted as constituting a reliable basis upon which to arrange dietaries for the more serious cases of gastro-intestinal disease, though of course every case requires special study and its own appropriate diet directions. I reproduce here in full the Penzoldt scheme:

PENZOLDT'S DIET TABLES FOR GRADUAL TRAINING OF THE DIGESTIVE CAPACITY

FIRST DIET (ABOUT TEN DAYS)

Foods or Drinks	Largest Quantity at One Time	Preparation	Character	How to be Taken
Bouillon . . .	250 gm. $\frac{1}{4}$ liter.	From beef.	Lean, very little salted or not at all.	Slowly.
Cow's milk. . .	250 gm. $\frac{1}{4}$ liter.	Well boiled, or sterilized (Soxhlet's apparatus).	Pure milk, or $\frac{1}{3}$ lime-water and $\frac{2}{3}$ milk.	If preferred, with a little tea.
Eggs.	One or two.	Very soft, just warmed or raw.	Fresh	If raw, should be stirred into the warm, not boiling bouillon.
Meat solution—(Leube-Rosenthal's) . .	30-40 gm.		Should have only a faint odor of bouillon.	Teaspoonful doses stirred into bouillon.
Cakes (Albert Six, biscuits) . .			Without sugar.	Not softened, but should be well masticated and insalivated.
Water	$\frac{1}{8}$ liter.		Ordinary or natural carbonated, containing a small percentage of carbonic acid (Selters).	Not too cold.

SECOND DIET (ABOUT TEN DAYS)

Foods or Drinks	Largest Quantity at One Time	Preparation	Character	How to be Taken
Calf's brain . .	100 gm.	Boiled.	Freed from all membranes and fiber.	Preferably in bouillon.
Sweetbreads, (thymus gland) . .	100 gm.	Boiled.	As the above. Should be peeled out carefully.	Best in bouillon.
Pigeons . . .	One.	Boiled.	Only if young, without skin, tendons, and the like.	Same as above.
Chickens . .	One, the size of a pigeon.	Boiled.	As above (no fattened chickens).	Same as above.
Raw beef . .	100 gm.	Finely chopped or scraped, with a little salt.	From the fillet (tenderloin).	To be eaten with biscuits.
Raw-beef sausage . . .	100 gm.	Without additions.	Smoked a little.	As above.
Tapioca . . .	30 gm.	Boiled to a gruel with milk.		

THIRD DIET (ABOUT EIGHT DAYS)

Foods or Drinks	Largest Quantity at One Time	Preparation	Character	How to be Taken
Pigeon . . .	One	To be broiled with a little fresh butter.	Only young birds without skin, etc.	Without sauce
Chicken . .	One	As above.	As above.	As above.
Beefsteak . .	100 gm.	With fresh butter, quite rare (English).	From the tenderloin, well beaten.	As above.
Ham	100 gm.	Raw, scraped fine.	Smoked a little without the bones.	With white bread.
Milk bread, toast, or Freiberg pretzels.	50 gm.	Baked crisp.	Stale rolls, etc.	To be well chewed and insalivated.
Potatoes . .	50 gm.	Mashed, or forced through a strainer. Boiled in salt water and mashed.	The potatoes should be meal-y, crumbling on crushing.	
Cauliflower .	50 gm.	Boiled in salt water as vegetables.	Only the flowers to be used.	

FOURTH DIET (ABOUT EIGHT TO FOURTEEN DAYS).

Foods or Drinks	Largest Quantity at One Time	Preparation	Character	How to be Taken
Venison . .	100 gm.	Roast.	From the back, hung for a time, but not gamy; without high flavor.	
Partridge . .	One.	Roast without bacon.	Young birds, without skin, tendons, feet, etc., after having hung for a time.	
Roast beef. .	100 gm.	Medium to rare	From well-fatted cattle; pounded.	Warm or cold.
Fillet . . .	100 gm.	Same as above.	Same as above.	Same as above.
Veal	100 gm.	Roasted.	Back or leg.	Warm or cold.
Pike	100 gm.	Boiled in salt water without any additions.	The bones to be removed.	In the fish gravy.
Perch-pike }				
Carp }				
Trout }				
Caviar . . .	50 gm.	Raw.	Russian caviar, slightly salted.	
Asparagus. .	50 gm.	Boiled.	Soft, without the hard portions.	With a little melted butter
Rice	50 gm.	Mashed and forced through a strainer.	Soft boiled rice.	Likewise.
Poached eggs.	Two eggs.	With a little fresh butter and salt.		
Omelette	Two	With about 20	Must have risen well.	To be eaten at once.
soufflé . . .	eggs.	gm. sugar.		
Stewed fruit .	50 gm.	From fresh boiled fruit, forced through a sieve.	To be free of skins and seeds.	
Red wine . .	100 gm	Light, pure Bordeaux, or similar red wine.		Slightly warmed.

It is noteworthy that Penzoldt allows no alcoholic stimulant until after the expiration of twenty-eight days of treatment and then only about three ounces of a light red wine. The calves' brain and sweetbread which he includes in his second

dietary are digestible enough, but in the light of recent knowledge unsuited to the many dyspeptics who are also lithæmic, on account of the large content of the alloxuric bases which all such glandular parts of animals contain. His prescription of raw sausage at the same early stage of the treatment of a serious stomach case would be open to criticism also from the point of view of most American authorities upon dietetics, and the raw meat liberally allowed in two of the lists would not readily be taken by many American patients, even if their physicians cared to let them risk the dangers of trichinæ, the bacilli of tuberculosis, etc.

Nevertheless the dietaries are founded in the main upon correct scientific data and will afford you valuable suggestions for your guidance in many difficult stomach cases.

LECTURE XXI

FEEDING BY OTHER ROUTES THAN THE MOUTH

It happens in many cases that for considerable periods either no food or insufficient quantities of it can be taken by the mouth. In round ulcer of the stomach, recent hemorrhage from the stomach or esophagus, whatever the cause may have been, and in corrosive poisoning in the upper part of the alimentary canal anywhere, most authorities now advise giving the stomach complete rest till the acute condition has been relieved; in gastric ulcer from one to three weeks. Food is given by the bowel meanwhile, and after such a period the usual method of taking nourishment per os is gradually resumed. In severer grades of gastrectasis it is also generally agreed that rectal feeding greatly assists the cure. In the worst case of this kind which I have ever seen, the patient having been reduced almost to a skeleton by the prolonged attempt to nourish exclusively by the mouth when there was frequent vomiting and very little absorption, I had not only all food, but also the medicines, administered per rectum, while the stomach was washed out daily and the viscus afterward treated by the induced current (faradic electricity), intragastrically. This patient made a good recovery and is now in fairly robust health eight years afterward. In cancer of the esophagus or of the cardia, or obstruction of either of these from any cause, the patient should be fed by nutrient enemas until the operation of gastrostomy can be performed.

The Technique of Rectal Alimentation.—Formerly it was considered necessary to have all proteid food introduced into the bowel previously peptonized, but Ewald first demonstrated that

the rectum and colon when healthy can absorb eggs, glucose, starch, etc., in such a form as to be assimilated and furnish nutriment to the system. Ewald's directions for the preparation of such an enema are as follows: Beat up thoroughly 2 or 3 eggs with a tablespoonful of water. Have ready beforehand a 20 per cent. solution of glucose boiled with a pinch of the best flour and add a wineglassful of claret. When this solution has cooled enough not to coagulate the eggs, the two are gradually stirred together and should not make in all more than half a pint. In hospital practice 3 to 5 eggs are beaten up and mixed with about 5 ounces of a 15 or 20 per cent. solution of glucose for the same purpose. The addition of 15 grains of table salt for each egg has been found by him and other observers to increase markedly the absorbability of such enemas. The latter are introduced with a soft rubber rectal tube several times a day, after a preliminary washing out of the bowel with a warm salt solution, and, it is said, can be continued for a long time in most cases without being rejected. My own experience has been that usually, by the end of a month, the rectum is likely to become irritable and then no longer to retain the injection. Ewald has found it necessary in some cases to add a little starch in order to make the solution more viscid and to overcome irritability of the bowel; also sometimes a few drops of tincture of opium.

He adds some further directions that are worth your particular attention, since care as to such important details makes often all the difference between success and failure. He has the patient lie in the dorsal or left lateral position during the introduction of the enema, though I have had better success with the patients lying at first on the left side and then after half an hour or so having them turn and lie on the right side with the hips somewhat raised upon a cushion. This, I fancy, helps to carry the enema by gravity over into the ascending colon and cecum, where it does not provoke efforts at expulsion, and where also there should be more rapid absorption than from the lower end of the large bowel. Ewald further advises

that the vessel holding the liquid be placed about two feet above the anal orifice of the patient and the enema be allowed to pass in very slowly. Time enough should be given after the cleansing injection to let all the fluid return before the nutrient enema is introduced, otherwise there would be danger of its coming away again immediately. Most authorities advise having the cleansing injections administered an hour before the nutritive enema; also that the quantity of the latter should not exceed half a pint. It is further important that the patient should rest recumbent for an hour after each nutritive enema.

Boas' Formula for a Nutrient Enema.—Riegel bears personal testimony to the effectiveness of the following prescription of Boas: Half a pint of milk, yolks of 2 eggs, a small quantity of salt, a tablespoonful of red wine and a tablespoonful of "Kraftmehl," instead of which special brand of flour probably any good wheat flour would answer as well. In view of the fact that albumin is especially required by the system and that the whites of eggs are quite as easily absorbed as the yolks, I usually order for an enema 2 raw eggs well beaten up and added to about half a pint of milk, a saltspoonful of salt, and when there is any need of stimulation, a tablespoonful of whisky or brandy. Sometimes sugar or glucose is also added.

But, notwithstanding that undigested food may be fed per rectum for weeks at a time, there are cases in which the nourishment needs to be continued in this way for much longer periods and then the method recommended by Leube has much to be said in its favor. It consists of chopped meat and fat mixed with pancreas in the following proportions: Chopped beef, 150 to 300 grms.; finely chopped and fat-free pancreas (from hog or cow), 50 to 100 grms. When fat is desired to be a part of the feeding, 25 to 50 grms. of this may be added. Riegel reports that in several of his cases he was enabled to keep patients alive for months by feeding in this way, and one patient with stricture of the esophagus was nourished for ten months by this means exclusively. Any method of rectal feeding which will accomplish such results should be considered

invaluable and resorted to in serious emergencies, regardless of the trouble involved in carrying it out.

Rectal alimentation should be employed as an auxiliary to other feeding much more largely than it now is. You will find it useful as such an auxiliary in any case in which, on account of disease in the stomach which prevents a complete and satisfactory nourishment of the patient by the mouth, the nutrition is suffering. Besides the desperate classes of disease above mentioned in which this method is resorted to for the purpose of saving life, it will prove helpful in hyperchlorhydria of severe type with low peptonizing power in spite of excessive HCl; also in numerous cases of hypochlorhydria, and still more in achylia gastrica when the digestive power of the stomach does not speedily come up under the treatment carried out, you might wisely administer nutrient enemas in addition to such an amount of food by the mouth as the patient can be made to take and digest. In such conditions this sort of supplemental feeding promises more than a dependence upon forced feeding by the mouth exclusively, especially if at the same time by the help of stimulating soups or broths, as well as by the administration of the appropriate stomachic medicines, the digestive power and the amount of food ingested have been increased as much as possible. Forced feeding is likely often merely to overburden an unwilling, because weak, stomach, while moderate feeding in such cases, supplemented by nutrient enemas, should bring up nutrition faster.

The Injection of Food Subcutaneously.—Emergencies have arisen which compelled a resort to other methods of feeding than either those by the mouth or rectum. When any of the conditions exist that preclude the taking of nourishment by the mouth and the rectum, or any part of the colon is the seat of disease acute enough to prevent the retention of enemas, some other means of feeding must be found if life is to be maintained. Under such circumstances subcutaneous feeding has been practiced for short periods with the result, apparently, of affording some sustenance. Numerous experiments on ani-

mals have been done to determine how such subcutaneous injections of certain foods could be borne and the results upon nutrition, and it was found that oil especially could be used in this way to some advantage. Other substances, as diluted milk, solutions of sugar, albumin, etc., have been injected in this way, and it has been demonstrated that these were absorbed without any local or general reaction. In the comparatively few attempts, however, in which subcutaneous feeding has been practiced upon human beings, olive oil or other bland fats have been employed, and while they seemed to be pretty well tolerated, exact experiments are wanting to show to what extent the food thus introduced has been utilized for the purposes of the economy.

Patients who were in danger of perishing for want of nourishment have also been placed in baths of warm milk with some apparent gain to their nutrition. However, the fact that a person in fair health may live for several weeks without any food at all makes it a little uncertain whether, in some or all of such cases, the patients were not really being sustained by the oxidation of their own tissues.

LECTURE XXII

METHODS OF TREATMENT IN GASTRO- INTESTINAL DISEASES

WHEN you are called to a case and have made the diagnosis, the most important thing of all is to decide, when possible, the origin or cause of the disease. In probably four-fifths of all gastric affections, as in most other disturbances of health, Nature would gradually effect a restoration to the normal condition, provided all causes of abnormal functioning could be radically and permanently removed. This point cannot be impressed and emphasized too strongly. Most of our failures are due to our inability either to discover the exact cause of the disease or to remove it when found. Manifestly, when the cause is in large part a bad inheritance, it cannot be removed; but fortunately, bad inheritance alone is rarely responsible wholly for the derangements of health which we are called upon to treat. It is merely a predisposing cause, and when in spite of it the patient can be induced to live in strict accordance with hygienic requirements, he may enjoy a good measure of health notwithstanding. Many failures in treatment occur in cases in which the physician has made a correct diagnosis, but places too little stress in his directions to the patient upon the importance of changing radically the faulty modes of living which produced the disease, and too much upon our remedies, especially drugs. Unless we stop the leak, however, which is draining away the energies of the patient, we shall make little permanent progress in curing him, whether we rely chiefly upon hydrotherapy, massage, or other manual treatments, electricity, vibratory stimulation, climatotherapy, or merely upon the most skillfully concocted combinations of medicine. For

example, if the patient habitually overtasks his brain or other part of his nervous system, he will be only temporarily relieved, not cured, by strychnine, phosphorus, etc., and would gain equally little permanent benefit from any of the above mentioned mechanical modes of treatment. The society woman who squeezes and drags her abdominal viscera out of place by tight corsets and heavy skirts suspended from the lower abdomen and spends most of her evenings up to a late hour in the polluted atmosphere of crowded assembly rooms, ending with an indigestible supper at midnight, will never be cured of her neurasthenia, nervous dyspepsia, or gastroptosis until her habits in these respects have all been brought into conformity with the common-sense rules of hygiene. Incidentally it may be said here, too, that the uterine displacements of such women can never be successfully overcome and their pelvic organs maintained in their normal place until the malpositions of the abdominal viscera above have been corrected and the causes of them have been removed by the patient's abandonment of the irrational modes of dress, as well as the development by suitable exercises of their abdominal muscles.

Again, the student and professional man who attempt to achieve impossible tasks by cutting short their allowance of sleep, and whipping up their exhausted energies to enable them to follow so reckless a method of work, by drinking strong coffee or other stimulant, can manifestly not hope to regain a normal tone in their nervous and digestive systems until they can be induced to apportion their hours of work, recreation, and sleep more wisely.

It should be still more manifest that the sedentary clerk or gluttonous man of leisure, who regularly eats twice as much food as the amount of exercise taken by him enables him to oxidize, cannot possibly recover health and stay well by the consumption of any quantity of stomach bitters or artificial digestants. He might find more temporary benefit from massage or hydrotherapy, since these procedures increase oxidation, but the gain would last only so long as the treatment

should be continued. Equally impossible is it to cure and keep well a patient who bolts his food without mastication and insalivation, and, regardless of Nature's requirements, takes daily into his stomach twice as much proteid matter as he does carbohydrates and fats, instead of letting them form one-fifth of the total, as is the normal proportion.

If, therefore, you would make permanent cures, insist as strenuously as possible that your patients shall reform their unhygienic modes of living—not only their eating and drinking, but also their neglect to take exercise—and that they shall breathe an abundance of fresh outdoor air as little contaminated by the poisonous products of our civilization as their means and opportunities will permit. There are ways enough in which the health is damaged, including many vices and unhygienic practices, into the details of which it is unnecessary to enter here. Suffice it to say that all departures from the normal in the way of living must be cured—reformed altogether—if the results achieved by our treatment are to be satisfactory and permanent.

Therapeutic Methods.—Coming now to the various therapeutic methods in vogue, I must ask the indulgence of strait-laced critics, if there still remain any who are in sympathy with the authorities satirized by Molière, and represented by him as having exacted of candidates for the degree of Doctor of Medicine an oath never to alter the practice of physic. For myself, I have always gloried especially in the fact that the adherents of regular medicine are broad and catholic, being fettered by no creed limitations, but free to make use of any remedy or therapeutic measure which experience has shown, or can show, to have value. This is in marked contrast with the creeds of the many sects and pathies which build pretentious therapeutic structures upon the slender foundation of a single dogma or some one narrow idea. Hence, in these lectures I do not hesitate to sanction the use of any remedy or therapeutic measure, whether, like cod-liver oil, its value was originally discovered by ignorant fishwives, or expectancy and minute

doses of drugs, the frequent effectiveness of which we learned from the homeopaths; electricity and water locally applied, the usefulness of which we learned from former eclectics and hydropaths so-called, or other forms of mechanical manual and vibratory stimulation, some of which are now becoming popular. According to my understanding of the doctrine held by us as regular scientific physicians, it is our duty to prove all things and hold fast to that which is quite regardless of its source or of alleged faults in those first employed it.

It is a hopeful feature of our present-day therapeutic more direct and manageable modes of influencing diseases that the administration of drug remedies are increasingly employed. We are learning that stimulation or sedation of a diseased organ can often be more quickly, certainly, and safely effected through the application of heat or cold by water or otherwise or through some one of the numerous other mechanical methods of treatment, gymnastic exercises, etc. These methods can now be so used as either to affect the whole system or to limit their action to some one or more parts without disturbing to any considerable extent the remainder of the body.

It is much more convenient and often more economical for the patients to depend upon medicines, except in so far as a skillfully arranged diet may promote the cure, and in many diseases, as, for example, the least stubborn cases of hyperhydria, chronic inflammation of joints, eczema, etc., medication with alkalies, nerve sedatives, or salicylates, or purgatives, etc., will often do the work quite effectually rarely without exerting an injurious effect upon other structures including some of the nerve centers, with a considerable diminution of the vital force which most chronic invalids can ill afford to sustain. Certain of the forms of electricity, etc., on the other hand, can now be so used as frequently to cure chronic conditions rapidly, not only without injury to other parts or any lowering of the general system, but, on the contrary, with the advantage of actually improving the general

nerve tone. It is exactly analogous to the modern treatment of fevers by cold baths, which act by strengthening the nerve centers, instead of antipyretic drugs or the older-fashioned bleeding and tartar emetic, which, indeed, lowered the fever, but at the same time lowered the patient.

Yet medicines are often indispensable to the cure of certain diseases and in very many cases, when used with the skill and precision which are possible only after making an exact diagnosis, may prove most valuable auxiliaries to the more directly acting mechanical forms of treatment.

But whether you administer medicines or apply other modes of therapy, or both combined, you will need to be careful that in your zeal to cure the patient you do not overdose or overdo in any way.

Overdosing and Overdoing in Therapeutics.—There can be no fixed dose of an active medicine any more than a uniform size for a drink of whisky. With regard to the latter, some persons would be intoxicated by a tablespoonful, while for others a half-pint tumblerful would merely steady their nerves. It is the same with cathartic medicine; we have all seen patients whom a teaspoonful of castor oil would purge, and when such persons get the usual drug-store dose of an ounce, harm must necessarily be done. So with all the energetic remedies of the Pharmacopeia. The same dose of any of them is likely to act very differently upon different persons, and what would be a suitable stimulating dose for those of robust constitution might seriously overstimulate weaker ones. The only safe rule, therefore, in prescribing for a new patient, is to begin with a dose somewhat under the minimum, and gradually increase it as found necessary to produce the desired effect. Such a precaution is scarcely less necessary in prescribing a new remedy for any patient. The so-called dosimetric method of administering minimum doses of the active principles of drugs, and repeating them at short intervals until the required effect has been obtained, has thus a real advantage in addition to the claim of its advocates that there is greater cer-

tainty in the results to be accomplished by the alkaloids as compared with the Galenic preparations of numerous remedies. It is safer than ordering a maximum dose at once in a threatening case with directions to repeat the same at definite intervals, regardless of effects.

What is true of medicines is equally true of other therapeutic measures. Even diet cures are often sadly overdone, to the great injury of the patient. The same is true of exercise, massage, electricity, etc. Patients differ most widely in their response to every sort of remedial agency, mechanical as well as medicinal, and what is sauce for the goose is decidedly not always sauce for the gander. You will find it wisest to begin with much less than the usual dose of any such agency and study its effect upon each individual patient.

Young physicians, especially, need to be reminded that Nature unaided makes innumerable cures, and that a very little assistance at just the right time and place may be all-sufficient; also, that our drugs sometimes harm more than they help. Even the Christian Scientists, faith curists, etc., occasionally produce astonishing results merely by stopping medicines which we had pushed too long or too vigorously. While, when we know our therapeutics and have studied our cases well, we should not be too timid and may often gain much by boldness in applying needed remedies, yet the German motto, "*Nur nicht schaden*"—"Only don't do any harm"—sometimes embodies the safest rule.

LECTURE XXIII

THE REMEDIAL VALUE OF ACTIVE EXERCISE, INCLUDING OUTDOOR GAMES, GYMNASTICS, ETC.

Exercise Indispensable.—A good muscular development and a daily use of the muscles, especially of the trunk muscles, are of the utmost advantage as aids to digestion. Body workers need give no thought to this subject, but those engaged in sedentary occupations must perforce do so if they would continue in even fair health. Sedentary workers with impaired digestions will find attention to this matter of physical exercise an important requirement. Most of them, by rising half an hour earlier in the morning, can go through a few gymnastic movements for the trunk muscles followed by a cold sponge bath, with great advantage, and when their day's work is done, unless unduly exhausted, should take as long a walk or as much other exercise in the open air as is practicable for them. But when the nerve force has from any cause been largely lowered and a condition of marked neurasthenia been set up, you would err gravely in advising them to increase the exhaustion which their daily labor itself produces by going through any gymnastic or other exercise in addition. Such patients often recover soonest with the help of a complete rest cure and in any case should, if possible, take a short vacation from work, devoting it largely to rest in the recumbent position, with an abundance of nourishing but digestible food. Failing this, they should at least so arrange their work as to secure the longest possible hours for sleep and fritter away none of their nervous energy by useless dissipations in the evenings. This is a most important practical point which cannot be impressed too

strongly upon all physicians who have the management of those complicated cases of indigestion which are mainly dependent upon neurasthenia or overtaxed energies.

It is highly probable that a proper attention to diet and exercise would prevent the development of nearly all the cases of gastro-intestinal disease not dependent upon traumatism or some other outside agency. The forms of exercise most valuable in the treatment of these affections are such as increase the tonicity of the abdominal muscles and the different muscular layers of the viscera, including the muscular walls of the stomach and intestines particularly.

Various Kinds of Exercise.—Rowing is doubtless the best outdoor exercise to effect this purpose, and among those practicable in gymnasiums or indoors elsewhere are the various turning movements, the rowing machines, exercises with pulleys, and the various other exercises designed especially for the trunk muscles, such as raising the upper half of the body from a horizontal nearly to a sitting position repeatedly. The swinging of Indian clubs and dumbbells, and many of the resisted movements which bring into action especially the abdominal muscles, are also useful. In addition to the special advantages to be derived from the exercise of the muscles above mentioned, a neglect of which is answerable for so much dyspepsia and constipation among professional men and women and others leading a sedentary life, it cannot be too strongly emphasized or too often repeated that exercise of the muscles generally is not only helpful in all such cases, but essential to the health of every animal. Our bodies are so constituted that without frequent movements of numerous groups of muscles the vital processes languish and very sluggishly and imperfectly perform their functions. Muscular movements increase all the oxidation processes and facilitate the circulation not only in the veins, arteries, and arterioles, but also in the lymph vessels. Therefore, after a proper regulation of the diet, the first step in the treatment of a dyspeptic, provided he or she be not profoundly neurasthenic and in need of

a prolonged period of rest with passive exercises (massage), electricity, and nutritious feeding, should be to see to it that enough exercise is taken to insure a perfect combustion, through oxidation, and a proper assimilation, of the food eaten. In selecting the kind of exercise to be prescribed, regard must be had, of course, to the physical condition as well as the social position, occupation, and tastes of the patient. Horseback riding would be the best suited to a large proportion of the patients who have the means and leisure to indulge in it, particularly since it offers a maximum of movement to most of the structures of the body, with a minimum of fatiguing effort; and, moreover, takes the patient usually into the country, where the air is pure and the surroundings enlivening. But we cannot prescribe this form of exercise for the wife of the workingman, who is borne down by the anxieties and cares of a large family; nor, as a rule, for the bookkeeper or stenographer, who must spend ten hours daily in the counting-room. The poor tired-out mother usually needs most a season of rest from her monotonous round of duties, a remedy rarely practicable for her; but all these victims of closely confining occupations would profit greatly by a daily walk, even though it should be only in the city streets or open squares, and would also gain much by sponging their bodies every morning with cold water, followed by vigorous friction with a coarse towel, and then devoting ten minutes to light gymnastic exercises designed to strengthen the abdominal muscles. At the very least they could several times daily take breathing exercises in front of an open window, and this would fill up their lungs with fresh air and lend additional vigor to the oxidation processes. Instead of such rational means of improving their physical condition, many sedentary indoor workers spend a large share of their evenings in crowded theaters or other assembly rooms, where their systems are still further poisoned by an atmosphere contaminated by illuminating gas and the emanations and exhalations from thousands of other human beings packed in nearly always imperfectly ventilated halls.

Special Forms of Gymnastics Recommended.—It may be as well to describe here a few of the more useful of the special gymnastic exercises which may be carried out in any well-ventilated room as well as in a regular gymnasium, or best of all, when practicable, in the open air, as upon the roof of a house so constructed as to permit of a roof garden upon it, or on any porch or piazza.

These include the special room gymnastics which I have long been teaching my patients. It is, of course, impossible to go fully into this large subject here with the small space at my command; but those of you who are interested in physical culture, as all of you should be, will naturally procure special books concerning it. You should instruct the patient always to begin by raising one or more of the windows in even the coldest weather, as there is comparatively little gain to be derived from filling up the lungs with exhausted and polluted air. Premising, then, that the windows are open and the patient's body clothed as lightly and loosely as practicable, let him begin by taking two breathing exercises, which are carried out as follows:

1. Stand erect, facing the open window and only a short distance back from it, with the hands at the sides, palms inward, the body kept perfectly erect. Raise the arms directly outward and upward until they are both horizontal with the palms still downward, meanwhile inflating the lungs through the nose slowly and continuously. Then let the arms fall rapidly to the sides, meanwhile exhaling as forcibly as possible so as to completely empty the air cells in order to permit of the entrance of a new supply of pure air. Repeat this movement three or four times and then,
2. Standing with the hands in the same position as before, raise the arms again to the horizontal, and then turning the palms forward carry the arms around nearly in the same horizontal plane until the hands meet in front. Continue the inflation of the lungs during the whole of this movement. Then, as before, let the hands suddenly fall to the sides while the lungs

are forcibly emptied. This movement can also be repeated three or four, or even more, times with advantage.

3. Begin now the gymnastic movements proper by supporting the body with the hands on the front of an ordinary chair

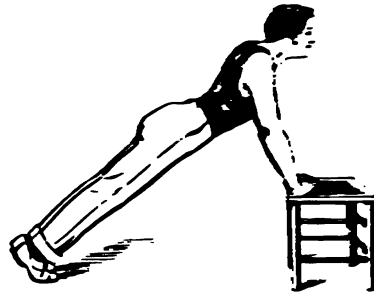


FIG. 32.—Chair exercise for arm and trunk muscles.

on either side, while the body is extended so that it is supported wholly upon the toes and upon the hands resting upon the chair. While in this position bend the arms at the elbows and swing the middle part of the body as far down as possible and then bring it back to the original position. This exercise

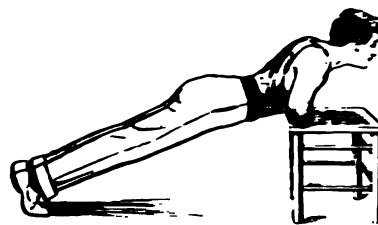


FIG. 33.—Second position of the same.

need not be done more than once during the first two or three periods of practice, and after that it may be repeated oftener up to three, four, or even five times in persons who have a fair degree of strength in their abdominal and back muscles. (See Figs. 32 and 33.)¹

4. Stand erect, with the feet eight to ten inches apart, and

¹ These illustrations have been taken from "Hygiene in the Treatment of Dyspepsia," published by The Brunswick Pharmacal Co. of New Brunswick, N. J.

without flexing the knees, bend the body forward, with the arms extended until the fingers approach as near to the floor as the patient can get them, while the knees are kept extended. In following this movement, the bend should be largely at the hip joints, but also in part at all the joints of the spinal column. Not many persons can reach the floor at first, but the majority

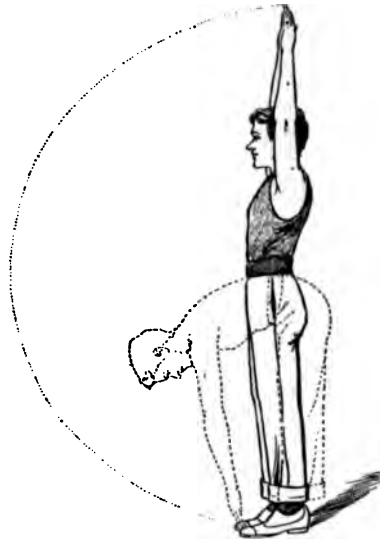


FIG. 34.—Forward and backward body-bending.

can after a little practice. This exercise, like the preceding one, should not be repeated more than once or twice at the earlier attempts, but with increased practice may finally be done half a dozen times during each exercise period. (See Fig. 34.)

5. Immediately after finishing Exercise No. 4, the patient should revolve the upper half of the body upon the hips as a pivot, bending first far forward, then to the right, then backward, then to the left and finally forward again and so on around. This last movement is not difficult and can be done five or ten times at once. It is very useful in stimulating the peristaltic action in the intestines and in strengthening the abdominal muscles.

6. Let the patient sit on a low stool and revolve as in the

preceding exercise. By reason of the flexed position of the thighs this produces even a greater stimulation to the peristaltic apparatus. (See Fig. 35.)

7. Let the patient lie down upon the back on a firm level surface, such as a rug upon the floor or on a straight couch.



FIG. 35.—Rotary movement of the trunk while sitting.

Then, while the lower half of the body remains horizontal, slowly raise the head and thorax to the perpendicular. Then as gradually return to the horizontal position, not letting the upper half of the body fall back quickly. After raising the upper half of the body in this manner, allow that part to remain horizontal while the legs are slowly raised as nearly to the perpendicular as possible and then as slowly returned to their former position. Repeat these movements each two or three times in the beginning, but later they may be gradually increased to twenty or thirty times at each exercise period, but never until fatigued.

8. Stand erect with the feet eight to ten inches apart and bend the knees as much as possible until the buttocks approach

closely to the heels in the squatting position, the body resting wholly upon the toes. Then slowly raise the body again to the original position. Repeat this two or three times at first and later five to ten times.

9. A very useful form of exercise which can be practiced while standing or sitting in a room, or even when walking out

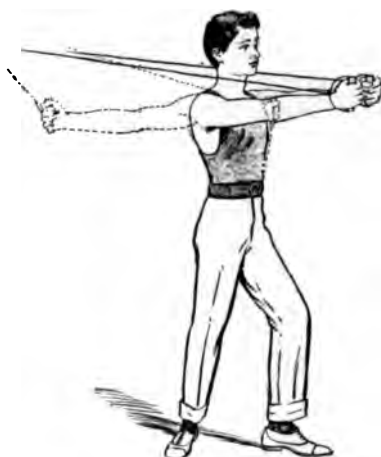


FIG. 36.—Pulley exercise for arm and trunk muscles.

of doors, is the alternate contraction and relaxation of the diaphragm and abdominal muscles, producing movements resembling those which constitute one of the Oriental dances first introduced into this country at the time of the Chicago Fair.

10. Exercises with pulleys or elastic cords as shown in the accompanying illustrations, Figures 36 and 37. The apparatus for pulleys with weights are cumbrous and somewhat expensive, but the elastic cords with pulley attachments are quite inexpensive and can be obtained of any dealer in athletic goods. These cords can be so used as to strengthen greatly the abdominal muscles, but the above-described exercises, 3 to 9, will effect the same results.

There are many other exercises which might be described here, but the above will suffice if carried out properly and

sufficiently often. They are those best adapted to the development of the abdominal and trunk muscles generally, whose functional activity is indispensable to a normal performance of the digestive functions. They should not be depended upon entirely, since other exercises for the development of the arms,

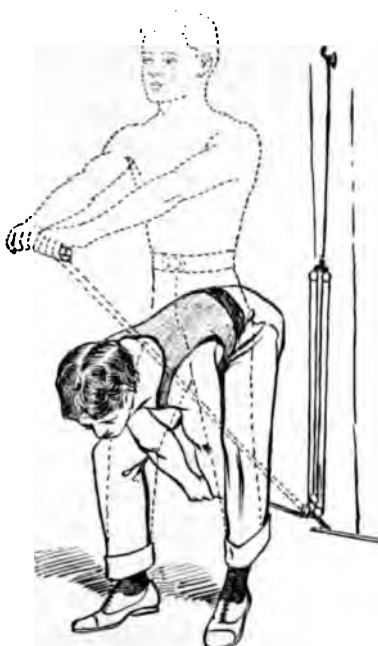


FIG. 37.—Same with low attachment of the pulleys.

the thoracic muscles or other trunk muscles, etc., are almost equally important; and no person ought to be content with the performance of indoor exercise exclusively, however good or often repeated. Exercise in the open air is very necessary to the restoration and maintenance of perfect health, and those dyspeptics who possess the requisite means and leisure should row, ride horseback, walk, or play at some not too violent outdoor game such as golf or croquet for an hour or two on at least every pleasant day the year round. The stronger patients may safely indulge in the more active games including tennis, basket-ball, bicycling, etc.

LECTURE XXIV

PASSIVE EXERCISES, INCLUDING MASSAGE—THE REST TREATMENT

THERE are numerous methods of modifying the nutrition of the body which are properly classed under the head of passive exercise. Chief among these are massage and unresisted Swedish movements. Similar movements resisted by the patients are really active exercise for both patient and operator. Riding in any kind of conveyance involves a constant vibration which is more or less stimulating—a passive form of exercise unless the patient drives a spirited team, when it may become decidedly active. Riding in trolley or steam cars affords thus a kind of passive exercise of which persons resident in the suburbs of cities necessarily take a certain amount daily. Some observant patients who travel ten to twenty miles every day in this way have reported to me that they find it stimulating or tonic, while weaker persons experience overstimulation and fatigue from the same cause.

The kind of vibration now produced by special machines, driven usually by electric motors and employed for the local stimulation of various parts of the body, comes under the same category, as indeed does the so-called manual therapy as well in fact as the various electric modalities. But these are discussed elsewhere in this series of lectures, under their respective heads.

Massage and the Swedish movements alone, to say nothing of the other kinds of passive exercise, constitute a very large subject, well worthy of your study—one concerning which many books have been written without exhausting it. Massage and the kindred passive movements afford a most valu-

able means of influencing the circulation and nutrition of all the bodily structures. It is often most clumsily done by incompetent manipulators and without a proper and intelligent supervision by the physician. In gastric and intestinal disease it is an efficient stimulant to both the secretory and motor functions in any part of the tract when properly given; but it may be even skillfully applied with the result of producing harm instead of good, as in cases of excessive secretion of HCl and in spastic constipation, in the latter of which there are spasmodic contractions of the circular muscles of the intestines with the result of retarding the onward passage of feces. Vigorous massage increases the previously existing hypersecretion of the gastric juice and also the spasmodic contractions above mentioned. Massage is sometimes too vigorously applied also over sensitive regions in the spine which would be benefited by very slight stimulation, but aggravated by the repeated and strong irritation of daily or tri-weekly forcible kneadings. In kneading the abdomen, too, much harm can easily be done when there is a displaced and tender, congested kidney, as well as in various acute or subacute inflammations. In brief, if all physicians were better acquainted with the extreme value of properly given massage in suitable cases and with the possible injuries which may result from it when improperly applied, this method of treatment would be much more widely and advantageously used than it now is. Massage can only be taught by practical demonstrations, and it would therefore be quite useless to give here any extended account of the various manipulations and the technique of applying them. Some time ago I observed carefully a series of cases in which abdominal massage was either the only or chief form of treatment. These were mostly cases of neurasthenia with the stomach more or less involved. In a larger number of cases under treatment by massage together with other therapeutic measures, the functional work of the gastric glands was greatly enhanced; but the difficulty in many of these is to determine to what part of the treatment the result was due.

HCl Increased by Massage.—In the following cases abdominal massage was the main dependence in the way of treatment; no drugs were given beyond a laxative, as required. The diet was a mixed one, from which sweet things, hot or fresh bread, shellfish and other highly fermentable articles were excluded:

CASE I.—Chronic gastric catarrh with slight intestinal catarrh in a professional man, aged forty-nine. There had formerly been an excess of HCl, but under treatment this had been reduced and for several months the percentage of that acid had ranged between .040 and .050.

After three weeks of abdominal massage, twice a day—morning and night—following the drinking of a glass of water, the HCl had increased to .114. No drugs had been given meanwhile, except small laxative doses of extract of cascara at bedtime.

CASE II.—Neurasthenia with anæmia and chronic gastritis. On March 13, 1897, the proportion of free HCl, by the Mintz method, was found to be .065; total acidity, 54. With no active treatment except abdominal massage, meanwhile, a test on April 15, one month later, showed free HCl .091; total acidity, 59.

A large number of cases have occurred in my practice in which a total absence of HCl, pepsin, and the rennet-ferment persisted in spite of both massage and the administration of HCl along with various other roborant measures, showing the existence probably of gastric atrophy; but in other cases of chronic gastric catarrh the amount of free HCl was finally restored under an energetic treatment by means of massage and galvanism together with the administration of both HCl and pepsin persevered with for long periods—in one instance for most of the time during a period of five or six months, with lavage employed in addition during a part of the time.

Since the welfare of the patient has always seemed to me greatly more important than even the establishment of a possible truth in medical science, I have never depended upon massage alone in any case of anacidity or achylia gastrica, but as the indications for supplying the deficient pepsin and acid

seemed so positive, and practical advantages derivable therefrom have often been so immediate and decided, I have generally administered these remedies as the first step, and proceeded afterward to add to the treatment, massage, electricity, exercise, and all other practicable building-up measures. The result has usually been favorable. When the gastric glands failed to respond, the internal remedies mentioned and all attempts to re-establish digestion in the stomach were abandoned, but a perseverance with massage and the other physical or mechanical measures have almost uniformly so improved the intestinal digestion that the patients have recovered finally a fair degree of health.

The following cases indicate that massage in certain very sensitive patients is capable not only of aggravating, but even of producing hyperchlorhydria.

Hyperchlorhydria Produced by Massage.—CASE III.—Neurasthenia with chronic catarrh and constipation in a literary man, aged fifty, who would not give up his occupation, and often overworked. He had been under treatment at times during the past three years. Tests, after the Ewald breakfast, had shown a small excess of HCl. After long having had a virtually normal gastric juice, for some time during the past autumn there had been a deficiency of HCl coinciding with increased fermentation in both the stomach and intestines and an unusual debility. An hour after the Ewald breakfast on December 1st, there was found to be a total absence of free HCl. He was ordered massage and also dilute HCl in 10-drop doses three times a day, an hour after each meal. The dose was to be added to half a glass of water and taken by sips during the hour following. He did not report again until at the end of three weeks, when his medicine was discontinued, though the massage was not. A day or two later the Ewald test breakfast was given him, and the result showed the highest degree of acidity ever found in his stomach contents—total acidity 82, and free HCl .167. It was afterward learned that he had been given an unusually vigorous general and abdominal massage treatment at nine o'clock the night before, and then having awakened very early on the morning of the test, he had tried the experiment of actively massaging his own

stomach in the hope of obtaining another hour's nap. An hour afterward he took the test breakfast. During the day following this test he was required to eat and drink exactly the same as on the preceding day, and to pursue the same routine in all respects except to have no massage treatment. The result was: total acidity 46; free HCl .087—only a little more than half the amounts respectively shown by the test of the day before after the unusual stimulation of the abdominal viscera by a second massage treatment within about seven hours.

Hyperchlorhydria Aggravated by Massage.—CASE IV.—Marked neurasthenia in a gentleman, aged sixty, with a history of very excessive hyperchlorhydria and frequently recurring attacks of gastralgia for several years. He came under observation early in November. In this case there is a strong suspicion of gastric or duodenal ulcer. Various kinds of treatment had been tried in New York and elsewhere, with temporary relief of the pain, but never with any notable effect upon the excessive secretion of HCl, which was said to have been on one occasion four times the normal amount. My first test showed a total acidity of 112, and free HCl .124. He was placed upon a diet as bland as possible to be obtained in a hotel and ordered a combination of alkalies to be taken in moderately full doses two hours after each meal. Massage was also prescribed to be given daily over the whole body except the stomach, though the masseur was directed to knead over the course of the colon very gently. At the end of eight days, a second test-meal showed the total acidity to be 104, and the free HCl .219. Close inquiry elicited the fact that the masseur had misunderstood my directions and been giving full and rather vigorous massage over the entire abdomen, including the stomach. This doubtless accounted in the main for the aggravation, though his food had included too much meat and had been more highly seasoned than was desirable, which must have contributed to the result. He was now removed to a private room in a hospital, placed upon a most careful diet, and no treatment of the abdomen permitted except the lightest effleurage over the bowels. Under these better conditions the proportion of acid was speedily reduced to the normal, though so long as the case remained under treatment it showed a strong tendency to rise again, requiring a continued use of alkaline remedies once or twice a day to hold it down. There was never a free hemorrhage from the stomach or bowels, and

no local tender points could be found either in front or at the back, but there was vomiting as well as much pain after taking food, and the existence of ulcer was quite possible.

The inference from the last two cases is obvious. Considering the serious and often disastrous results to health that may come from hyperchlorhydria with its train of intestinal and nervous symptoms, and the readiness with which it can be greatly increased by massage of the abdomen, this powerful remedy should be prescribed with great carefulness and with more exact dosage than is now customary; and it needs to be remembered that in many neurasthenic patients with a tendency to excessive secretion of the gastric glands, even very moderate massage over the abdomen can set up this troublesome condition with a resulting aggravation of the constipation, as well as of the insomnia and all the nervous symptoms.

Indications for Massage of Abdomen.—It may be well here to summarize in tabular form the conditions under which massage of the abdomen has been found in my experience particularly useful:

1. Chronic gastritis in all its forms excepting those accompanied by hyperchlorhydria.
2. Anacidity or subacidity, except when dependent upon acute gastritis, carcinoma, or, though this does not often co-exist, ulcer.
3. Gastrectasis, not dependent on, or associated with cancer or ulcer.
4. Atonic conditions of the stomach walls, whether progressed to the stage of dilatation or not.
5. Displacements of the various abdominal organs, including
 - a*: Gastroptosis.
 - b*: Nephroptosis, except in cases in which the displaced kidney has become excessively tender on pressure, and always with care to avoid manipulating the movable kidney.
 - c*: Enteroptosis.
 - d*: Hepatoptosis.

6. Chronic intestinal catarrh, not complicated by deep ulceration.

7. Dilatation of the intestines.

8. Chronic catarrhal appendicitis.

9. Constipation from unknown causes with the exception that deep or vigorous kneading may aggravate the spastic forms and those resulting from stricture or other serious obstruction. In many cases massage alone cures.

10. In a group of symptoms which comprise especially tenderness, over a region three or four inches in diameter including the umbilicus as its center, and a marked pulsation of the abdominal aorta in the entire epigastric region. These symptoms have been assumed, with how much of truth I am not prepared to say, to denote congestion or irritation of the solar plexus or of one or more of the other plexuses of the abdominal sympathetic. They are often met with in practice and may be the result of auto-infection from the gastro-intestinal tract. My experience shows that these symptoms are usually benefited by gentle kneading of the abdomen in connection with careful attention to diet.

The following are the principal

Contra-Indications for Massage of the Abdomen:

1. Ulceration in any part of the stomach or intestines.
2. Cancer of any of the abdominal organs.
3. Acute inflammation of any abdominal or pelvic organ.
4. Hyperchlorhydria, or acid gastritis, or, indeed, any of the forms of excessive secretion of the gastric juice.
5. Prolapsed kidneys which are sensitive to palpation.
6. Aneurism of any of the abdominal or thoracic arteries.
7. During the menstrual period, when the flow is excessive or when there is a tendency to menorrhagia.
8. In fatty degeneration or marked dilatation of the heart and advanced phthisis, especially with a tendency to hemoptysis, abdominal massage should be practiced—if at all—with much care and gentleness.

In addition to the foregoing, Boas, on the authority of Dr.

Zabludowski (a well-known masseur and writer on massage in Berlin) mentions, as another contra-indication, a tense condition or kind of tetanic contraction of the recti muscles, which is so often seen in cases of neurasthenia. In such cases, Zabludowski advises "hands off." Zabludowski's method (as I happen to know from personal experience of it, when in Berlin in 1895) is one in which tapotement and a peculiar mixture of violent slapping and vigorous kneading predominate. These procedures would be harmful, of course, under the conditions above referred to, but the gentle stroking and kneading which are given to such patients, under my personal direction, have been found uniformly helpful and curative to the underlying disease, and at the same time soothing to the overtense muscles.

Boas would also permit massage in cases of gastric ulcer, except where adhesive inflammation has attached the stomach to adjacent organs, and very properly advises caution in massaging the stomach or intestines when overfilled with contents or even with gases. It seems to me, however, wiser to avoid massage of the abdomen altogether in the cases in which there are positive signs or symptoms of ulcer, and especially when these (as nearly always happens) include hyperchlorhydria.

Most of the foregoing contra-indications are self-evident, and need only to be mentioned.

In cases of chronic gastric catarrh, it is well to have massage of the abdomen given in the morning (fasting), the patient having first taken one or two glasses of water which may be medicated with some alkali or an antiseptic when advisable. This is much less efficient in cleansing the gastric walls of the adherent viscid mucus than lavage, but may help in patients for whom the latter is impracticable.

The value of massage of the abdomen in cases of malnutrition associated with indigestion of atonic type and with deficient secretion of the various glands involved, can hardly be overestimated. In suitable cases and when properly given under the physician's personal supervision it accomplishes very

much more than drugs, stimulating, as it does, every gland, muscle, and other tissue within reach of the operator's fingers. In this way the metabolic processes are all quickened. More food is transmuted into blood which in turn is better purified by a more active elimination of the toxic products of tissue metamorphosis, and a larger amount of richer, purer blood, is continually brought into contact with all the structures acted upon.

In this way, what was a vicious circle is broken up and the conditions are so changed that the processes can proceed with more activity toward a perfect restoration of health.

The Rest Treatment.—The institution of this method of treating numerous cases of debilitated persons by Dr. S. Weir Mitchell, some thirty years ago, marked a great advance in therapeutics. It has been applied chiefly in markedly neurotic or hysteric patients, but is well suited to certain classes of dyspeptics, especially those whose cases are complicated with neurasthenia.

In commenting on this method in a recent editorial¹ I used the following language: "By this method such patients are not only given the absolute rest in bed which is grateful to many of them, and helpful to nearly all of them, but, what is far more important, are thereby removed at once from numerous actual or possible disturbing causes—from mental strain, overexcitement or overexertion of any kind, nagging cares and worries, the temptation to dietetic indiscretions as to food or drink, late hours with insufficient sleep and dissipation of whatever form, whether downright vicious and under the ban, or fashionable and approved by society, no matter how unhygienic. All such dangers, known and unknown, are cut off at one blow by the rest treatment, and many of them are particularly efficient causes of hyperchlorhydria."

I might have added with equal truth that the method is helpful in the cases of most women who are at once dyspeptic and neurasthenic, whatever the form of the gastric derangement

¹ *Int. Med. Mag.*, June, 1903.

may chance to be; but with this qualification that when the analysis of the stomach contents shows an excessive secretion of HCl, stimulation of the gastric glands by vigorous massage, as has already been explained, is unsuitable and likely to aggravate; and whenever the tests of the gastric motility in such cases show marked atony of the stomach walls, especially if there be fully developed gastrectasis, the large dependence upon a milk diet which is the usual routine in the rest cure, would need to be replaced by a less bulky and more solid diet. A form of rest treatment is particularly well adapted to, and has proved in large numbers of cases brilliantly successful in, gastric ulcer, in which disease it is supplemented most effectually by rectal feeding at first and later by a liquid diet, chiefly milk.

LECTURE XXV

ELECTRICITY: GALVANIC, FARADIC, AND STATIC—HIGH-FREQUENCY AND POLY- PHASE CURRENTS

Electricity.—We are probably just beginning to learn the methods by which the various forms of electricity may be applied with advantage in the treatment of diseases of the stomach and intestines. In addition to the galvanic and faradic currents, which have been increasingly used for many years by leading clinicians in these lines, the static spark, static breeze, and more recently the secondary (electrostatic) currents obtained from the static machine, for which we are indebted to Dr. W. J. Morton, as well as the so-called currents of high potential and high frequency, are finding a by no means unimportant place in the therapy of these cases.

With a few exceptions, even the more recent works on the diseases of the digestive system do not devote sufficient attention to the method of applying these various forms of electricity.

The Continuous Current, or Galvanism.—Central galvanism, *i. e.*, the continuous current passed through the cerebral and spinal centers, as first described by Beard, is usually effective in nervous dyspepsia and the numerous nervous complications of the indigestions when at the same time proper attention is given to the diet, and a suitable apportionment of rest and exercise; but some of the electrostatic currents, and probably mechanical vibration, can now do as much or more, in skilled hands. Applied intragastrically, or in sufficiently large doses, 20 ma. or more, externally through the gastric region, galvanism is often effective in gastralgia and all the sensory derangements

of the stomach, especially when dependent, as so many of them probably are, upon faults in the great nerve plexuses of the sympathetic system in the abdomen. Central galvanism is fully described and illustrated by Rockwell,¹ and the accompanying cut, taken from the latest edition of his work, gives a good



FIG. 38.—Central galvanization.

idea of the procedure. Moderately strong currents of 10 to 30 ma. (and Doumer employs even 100 ma. with electrodes 6 cm. in diameter), applied directly over and to the sides of the abdomen, have been highly recommended by recent French writers in the treatment of chronic intestinal catarrh, and ought to exert a curative influence upon chronic catarrhal appendicitis in its earlier stages. In doses of 1 to 5 ma. galvanism has been

¹“Medical and Surgical Electricity,” by A. D. Rockwell, A. M., M. D., New York, E. B. Treat & Co., 1903.

applied beneficially within the rectum for chronic proctitis, hemorrhoids, etc., though great caution is required in its application here, since damage can easily be inflicted by using a dose relatively too large for the sensitiveness of the part or the stage of the disease. Small doses are safest in this region.

Besides its value in relieving pain in the stomach, the galvanic current, applied intragastrically, has also proved efficacious in certain cases of chronic gastritis.

Strictures in accessible parts of the alimentary tube, as particularly in the esophagus and in the rectum or its vicinity, are, to some extent, amenable to treatment by a constant current in the form of either a very gentle electrolysis or dilatation with metallic bougies connected with the negative pole of a galvanic battery, a mild current of 3 to 5, and never more than 10 ma., being applied. Robert Newman¹ claims to have used this method in the urethra for thirty-six years and cured thereby 2500 cases of stricture in that tube without a failure or relapse. Many surgeons claim to have tried the same method and failed, but Newman was certainly successful with it.

The Induced Current, or Faradic Electricity.—This form of electricity may afford the greatest assistance in the treatment of certain gastro-intestinal diseases. Like central galvanism, what is known as general faradization, either alone or in connection with central galvanism, proves often very helpful in the treatment of all forms of neurasthenia, including especially those associated with dyspeptic derangements. The technique of these and of the various other methods of electric treatment is fully described in Rockwell's work already cited. The faradic current has been found effective in restoring tone to the debilitated abdominal muscles as well as the muscles of the viscera even when applied externally, and has proved particularly effective in the latter direction, when brought directly in contact with the internal lining of the cavity to be affected. This statement is unquestionably true, however the effect of the electricity may be explained, and quite regardless of the contention upon this sub-

¹ *Jour. of Advanced Therapeutics*, September, 1903, p. 554.

ject as to the possibility of producing contractions by electric stimulation of the muscles through the mucous membrane from within or through the abdominal parietes from without. It matters little in what way the curative results obtained by electricity in the stomach are produced. Personally, however, I believe that such stimulation does produce contractions of the muscles in question, since the contractions can often be distinctly noted in the human being. I was the first to publish the observation that faradic electricity, applied intragastrically, tends to lessen the secretion of the HCl in the gastric juice, slowly after a primary stimulation during the earlier treatments when coils having coarse short wires are used, and much sooner when coils with long fine wires and very rapid, smoothly acting interruption are employed.

These last forms of battery constitute the so-called high tension faradic apparatus. But I shall have more to say of this when I come to the subject of intragastric methods.

Static electricity until very recently has not been employed in treating diseases of the stomach and intestines. Even now its employment is confined to a small proportion of physicians who do electric work, and few specialists in the treatment of diseases of the nervous and digestive systems are using it to any large extent. It affords, however, a most valuable addition to our resources in these affections. Nervous dyspepsia and the various gastric and intestinal neuroses are particularly susceptible to cure through its agency. Sparks, the static bath or breeze, the localized brush discharge, frictional applications, the static wave current, and the static induced current can any of them afford marked assistance in the treatment of certain gastro-intestinal troubles and particularly in the nervous derangements associated with or dependent upon them, as well as in certain forms of renal diseases which result from them.¹ The long percussive sparks are applied to the spine as a means

¹ The Effects of the Secondary Static Currents in Removing Albumin and Casts from the Urine, with Reports of Cases. By Boardman Reed. *Am. Medicine*, November 28, 1903.

of general tonic treatment, or to the liver, stomach, and lower abdomen over the intestines when these are to be aroused to more energetic functioning, especially the musculature of the latter. The static bath is a milder general tonic applicable to cases which cannot easily bear the slight pain of the sparks, while the breeze and local brush discharge are suitable for the

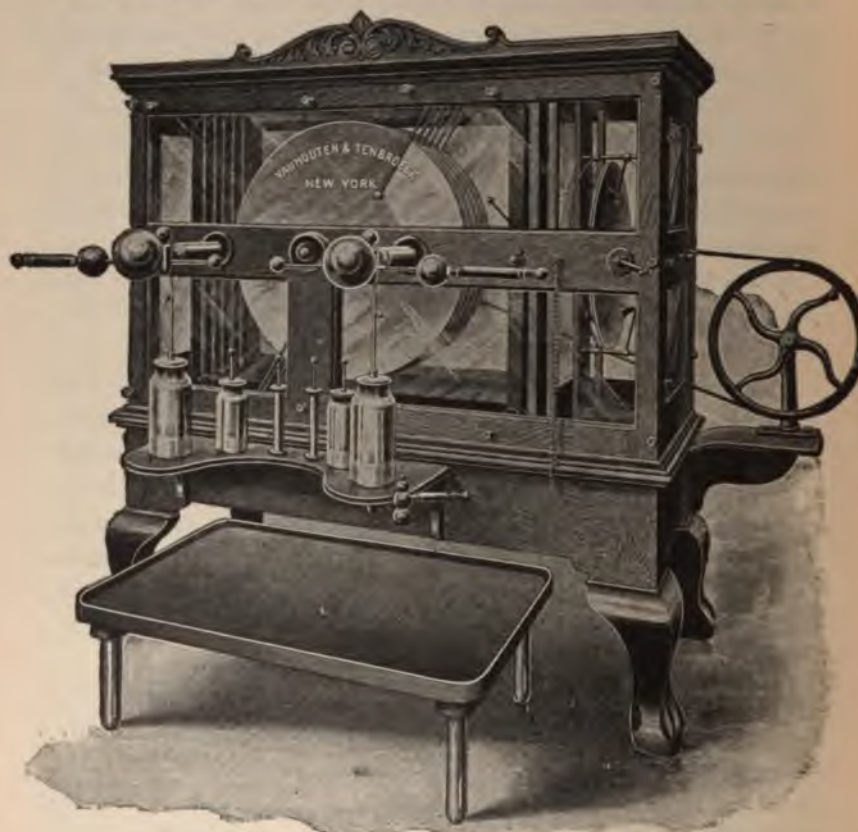


FIG. 39.—The static electric machine.

stimulation of regions which are intolerant of the stronger spark applications. The static wave current, applied to the entire spine, acts again as a remarkable general tonic and vital stimulant, and by means of this current a profound stimulation

of the nutrition can be effected in any organ lying near the surface of the body. The static induced current can do whatever can be done with the ordinary faradic induced current, being especially similar to the high-tension form of the latter, but in consequence of its greater voltage and rapidity of interruptions, the effect is greater.

Physicians unfamiliar with the uses of static electricity and totally ignorant upon the whole subject have sometimes expressed the opinion that the results obtained thereby are psychic and due wholly to suggestion. At one time I leaned to this view myself; but after being cured by static sparks of a very stubborn neuritis for which other therapeutic measures had failed to accomplish anything, I changed my mind. Moreover, in numerous recent cases of autotoxic nephritis resulting apparently from chronic indigestion, I have seen the albumin and casts rapidly removed by the static wave current and static induced current; and in one large series of cases analyses of the urine made shortly before and after the application of such currents showed an increase of the urea at the second examination in every case with a single exception. Such clinical results and experimental data must suffice to cure the skepticism of any physician who is open to conviction.

High-Frequency Currents.—High-frequency currents are among the newest developments in the way of electricity. They are alternating currents in which the alternations are prodigiously rapid. The effects are in many cases extraordinary in the direction of improvement in the nutrition. They produce almost no sensation in the part to which they are applied except a merely agreeable warmth and feeling of vibration, and yet in suitable cases the results are highly favorable. Their action is similar to that of the static wave current, especially except that they produce less sensation and therefore can be applied within the cavities of the body quite painlessly and generally with benefit whenever the parts to which they are applied are in an atonic condition resulting from imperfect nutrition. They have already been employed

largely in France and England and to a less extent in this country in the treatment of atonic dyspepsia, gastric dilatation, constipation, etc., and Herschell of London claims to have

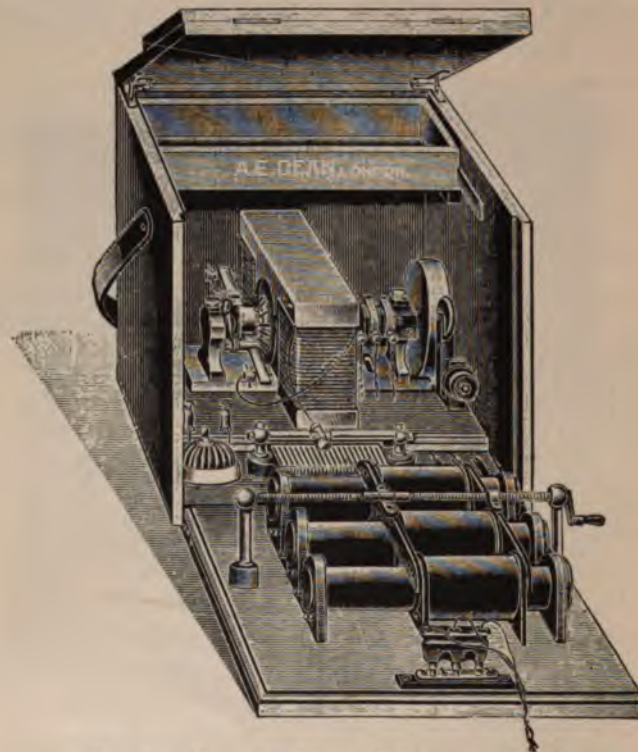


FIG. 40.—Herschell-Dean triphase apparatus.

found them, when applied within the stomach, even more efficient in hyperchlorhydria than the high-tension faradic current, which he has used extensively with the help of my modification of the Einhorn intragastric electrode¹ and confirmed the fact first observed and reported by me that this latter current is effective in lessening hypersecretion.

¹ "Manual of Intragastric Technique," by Geo. Herschell, M. D., London, 1903, p. 147.

Polyphase currents are the very latest form of electric stimulation to be applied in the treatment of disease. They have been used for several years in France, and Herschell of London has very lately published a small monograph upon the subject, besides having devised a number of instruments and apparatus for the application of them.¹ He employs the tri-phase current especially, and claims for it the power of raising the blood pressure in the numerous cases of neurasthenia which are characterized by a low arterial tension. He finds it very useful also in nervous dyspepsia, hyperæsthesia of the gastric mucous membrane, muscular atony of the stomach, constipation, and various other gastro-intestinal affections. Indeed, he gives it the preference over all other forms of treatment for "restoring the tone to the muscular substance of the gastro-intestinal tract."

¹ "Polyphase Currents in Electrotherapy," by Geo. Herschell, M. D., London, H. J. Glaisher, 1903.

LECTURE XXVI

VARIOUS FORMS OF ELECTRIC AND HYDRO-ELECTRIC CURRENTS APPLIED DIRECTLY WITHIN THE BOWEL

THE induced current (faradism) has long been applied within the rectum for constipation with good results, this method often relieving the condition and sometimes curing it by stimulating the sacral plexus as well as the muscles directly involved in defecation. Three to fifteen ma. of the continuous current can be used in the same way. The negative pole is usually applied within the bowel. More recently the electrostatic currents discovered by Morton, the static wave and static induced currents, have been used successfully in the rectum for the cure of the same disease, as well as for chronic prostatitis and other affections not coming within the scope of these lectures. The very similar high-frequency currents of D'Arsonval are employed in like manner to effect the same ends.

Dr. S. Cohn of New York, in a paper published in the *New York Medical Journal* of September 6, 1902, described an effective way of employing the static currents in the treatment of constipation, as follows:

"I use static electricity either in the form of the wave current or of the static induced current; the first in the milder forms of constipation, the latter in the very obstinate cases of long standing. The polarity is of importance, as the positive pole has a stronger effect on the tissues it is in contact with than the negative pole.

"In using the static wave current the patient is in contact with one pole only, while the other one may be grounded or not.

If we use a current without grounding, the current is a very mild one. By grounding we make the current considerably stronger. The contact is made either by the rectum (the patient sitting on the upright rectal electrode) or by the abdominal walls (tinfoil plate, 8 by 10). The current strength is regulated by the spark gap between the sliding poles.

“The static induced current enables us to use very powerful means without causing the patient any pain. The static induced current is, in reality, a current of high tension and high frequency. While the static wave current distributes its strength over the whole body, the static induced current concentrates its whole strength between two points of the body. The patient is connected with the outer surface of the Leyden jars, while the inner surfaces are connected with the poles of the machine. One electrode is generally on the abdomen, the other one either in the rectum (direct) or on the back (percussive). The current strength is also regulated by the spark gap. As the patient need not be insulated, we can also use the labile method.

“The powerful action of this current, as well as that of the wave current, may be enhanced by a mode of administration called the undulating or swelling current. By this we understand a current that, starting from zero, gradually swells to a maximum of strength and returns in the same way to zero. By alternately increasing and decreasing this current, we produce in the muscles alternations of wavelike contractions and relaxations. The effect of this mode of administration of the current is a tonic exercise of the muscles, and, in using it, we do not risk the danger of overworking and exhausting the muscles, as their maximum contractions are only of short duration. The circulation of the blood and lymph will certainly be accelerated by this milking-like process, and we can readily understand how the atonic condition of the tissues is improved. On the static machine we get the swelling current by slowly removing one pole from and then approaching it to the other.”

Hydro-electric Applications within the Bowel.—Bondet, of Paris, originated the method of applying the continuous current to the mucous membrane of the rectum and entire colon with that best of all electrodes, water, as the internal means of contact with the parts to be influenced, and large flat electrodes of any convenient material for the external one. It is an excellent means of treating chronic intestinal catarrh especially, as well as other intestinal disorders. I found this method in use in Ewald's Clinic in 1895, and a serviceable apparatus was employed there for the purpose. Dr. Margaret Cleaves has also devised a good form of apparatus for conveying both the water and the electric current into the bowel, and an illustration of it is shown on page 289.

From a paper contributed by Dr. Cleaves to the *International Medical Magazine*,¹ I reproduce the following extracts describing the technique of applying this hydro-electric treatment:

"A normal or physiologic saline solution of six-tenths of 1 per cent., at a temperature of 100° F., is used, and as it flows into the intestine becomes the electrolyte conveying the current to every part of the mucous membrane with which it comes in contact. The indifferent contact is made by means of a large (at least forty-five square inches in area), well-wetted electrode to the hepatic area and abdominal wall, or to the lumbar cord and lumbo-sacral plexus, according to the indications in each individual case. If a direct stimulation to the origin of the nerve supply is paramount to the stimulation of atonic and relaxed abdominal walls, the latter should be used, otherwise the former; and the writer often uses a two-way contact, *i. e.*, by means of a bifurcated cord attached to both the spinal and abdominal electrodes. In this event the greatest expenditure of energy will be between the intestinal and spinal contact, because by reason of the pressure from the recumbent position as well as by the absence of fat, characteristic of the average abdominal wall, a better contact is secured and resistance di-

¹ *Int. Med. Mag.*, October, 1902, p. 603.

minished. There will also be an expenditure between the intestinal and abdominal contacts, but not so great, by reason of increased resistance, as in the former instance. The indications for the placing of contacts in each individual case must be governed by the pathology of that particular case. As hepatic torpor, associated with congestion of the liver and congestion, even catarrhal inflammation of the gall-duct and bladder, exist very commonly in the class of intestinal conditions under consideration, the hepatic and abdominal contact is imperative.

“A long curved electrode of hard rubber may be used or one of soft rubber, as is used in the administration of a high enema.



FIG. 41.—Dr. Cleaves' long curved electrode for hydro-electric applications within the bowel.

In the event of disease at the sigmoid flexure a localized action can be obtained at that point by the use of a double current or irrigating electrode.

“By the use of the long electrode, at least eight inches, the fluid is carried beyond the reflexes governing defecation, thereby modifying the desire to empty the bowel during treatment, and permitting a sufficient expenditure of energy to secure the desired result. With the patient in position and the body contacts carefully adjusted, connection is made between the electrode, the hose of the irrigating jar, and with the conducting cord from the terminal of the battery indicated in the particular case. The water is then turned on to permit of the expulsion of air from the electrode and also to allow the water which has cooled to pass out of the hose. This done, and a little vaselin placed at the anus to facilitate the entrance of the electrode, it is introduced in the same manner as in an ordinary irrigation of the intestinal tract. In the introduction of the

electrode great care should be taken to avoid pain. No forcible pressure should be used, but it should be allowed to glide easily into position. This can readily be accomplished if it is allowed to follow the curves of the bowel, *i. e.*, toward the umbilicus for the first one and one-half inches, then toward the hollow of the sacrum. In the average case there is no pain or discomfort from its introduction, save just as the bulb passes the sphincter ani muscle. If difficulty is experienced the water may be turned on in order to distend the rectum, thus facilitating the introduction. When this is accomplished and the water flows freely, the current is gradually turned on. Only such a pressure or E. M. F. should be used as is necessary to overcome the resistance of the conducting circuit, for here a destructive action is not desired, but rather such an expenditure of energy as will tend to establish nutritive processes. This extensive water electrode, affording as it does a large square inch area of surface, makes it possible to secure by the use of a low E. M. F. a large current strength, and therefore great electric energy without pain or discomfort. A rate of flow, however, of from 1 to 20 or 30 ma.'s may be used according to the pathologic conditions and the patient's tolerance of the current. Under no circumstances should the application be carried to the point of pain, other than the griping induced by the peristaltic action resulting from its use. There are varying degrees of tolerance in different patients, according both to the pathology and personal idiosyncrasies.

"If there are adhesive bands due to an old peritoneal inflammation, they are put upon the stretch by the distention of the bowel with water and pain results. Care must be taken not to permit the flow of sufficient water to cause pain and subsequent soreness. Gradually the amount can be increased, thereby securing greater current distribution, but no sudden violence should be done, nor should the bowel be so distended at any time as to perpetuate a parietic state. In cases of colitis, especially if the condition approaches a subacute type, a minimum expenditure of energy must be made, and in many instances

an amperage of from 1 to 5 milliamperes is not only sufficient, but all that can be tolerated, while in the average case 10 to 20 ma.'s suffice. Nothing is to be gained by carrying the application to the point of pain, which is an indication of too great and hurtful expenditure of energy. In the event of an increase of current, as the resistance is overcome, causing pain or discomfort to the patient, it should be turned off until it is again brought to the point of the patient's tolerance.

"The time limit in these applications must be governed by the patient's ability to retain the water. Patients differ in this regard. In some cases a pint is with difficulty retained and an application of only from three to five minutes is possible. These are the cases where the lower bowel is more or less filled with hardened fecal matter, which not only prevents the electrode slipping into place, but obstructs the opening of the bulb, preventing, in the first place, the free ingress of water and in the second its passage beyond the reflexes governing defecation. Because of this it is good practice to direct the patient to take a small rectal enema before coming for treatment. Subsequent applications can be more successfully made. From one to three quarts of water may be used for from five to ten minutes before the desire to empty the bowel becomes urgent. In pathologic conditions characterized by extreme atony of the intestinal tract, a considerable quantity of water will be tolerated on account of the loss of power in the intestinal coats. As normal contractility is established a gradually lessening quantity can be retained. In all cases less water should be used in successive administrations. As nutritive changes are established in the intestinal tract with a tendency to recurrence of normal peristaltic movement, the desire to empty the bowel comes much more promptly than in the earlier applications.

Measures to Combat Possible Collapse from Sudden Emptying of the Bowel.—"From the very complete emptying of the bowel, which almost always follows the first treatment, a condition of more or less profound collapse may arise. This should be combated by the administration of from one-half to

one pint of hot water *per os* and rest in the recumbent position. This rarely occurs after the first treatment, and seldom then.

“The current may be reversed in order to secure a more stimulating effect, or interrupted. Sometimes an application of the combined continuous and induced currents may be made, but the writer uses, as a rule, a subsequent application of the sinusoidal current or a general application of the franklinic current. In the large undulatory or wavelike contraction of the sinusoidal current of low frequency, a slow-moving stimulus, fully applicable to the excitation of slow-moving processes, is obtained. One of three things will promptly follow an intestinal hydro-electric treatment; first, a free and complete evacuation of the bowel, followed by a sense of great relief, accompanied in some cases by more or less severe collapse; second, a certain amount of fecal matter may be expelled, with gas; or, third, discolored water may be passed, with or without gas. In the latter condition the treatment should be repeated in at least twenty-four hours, and in intestinal occlusion in from seven to eight hours. In the latter condition at least three applications may be made within the twenty-four hours. In the chronic catarrhal conditions associated with constipation, treatment should be given at first every other day. The frequency of the séances must be governed by the patient's response. As soon as a tendency to normal peristalsis is established, less frequent applications should be made. The average length of time during which treatment must continue depends upon the nature, degree, and standing of pathologic change, as well as the individual recuperative power. In the writer's experience from one to three months has sufficed. Upon the establishment of nutritive changes with a return to normal peristalsis, the intestinal treatment should be discontinued, and the further management of the case made a matter of hygienic and dietetic detail, regular habits, and healthful dress.

“In the average case the active, *i. e.*, intestinal contact, should be attached to the negative terminal, on account of the

characteristic polar action. In catarrhal conditions associated with diarrhea, a silver or a copper wire may replace the platinum wire in the electrode and the intestinal contact attached to the positive terminal. In this way a mild application of either the silver or the copper salt may be made to the intestinal mucous membrane, and also driven in cataphorically, as well as the stimulating and regenerating influence of the current utilized. Or, if preferred, the water may be suitably medicated and used at the positive pole.

The Hydro-electric Method in Muco-membranous Enteritis.

—“ In the treatment of muco-membranous enteritis, the intestinal tract benefits by irrigation with a physiologic saline solution at its normal temperature, which frees the mucous membrane of mucous shreds, pus cells even, as well as retained fecal matter, while by the well-known chemical action of the current, nutritive changes are established in the glandular structure, nerve centers stimulated, circulation quickened, and absorptive activity increased. Of a considerable number of such cases treated, all had run a persistently chronic course, were characterized by irregular exacerbations, lack of marked febrile excitement, with derangement of the intestinal canal, muco-membranous discharges, mental depression, greatly impaired health, also by more or less gastric disturbance, impaired appetite, repugnance to food, furred tongue, and foul breath. All were of some years' standing and had resisted the remedial agents administered from time to time when the subject of medical attention. At the time they passed from observation, several months after the discontinuance of treatment, they had normal appetites, relief from gastro-intestinal distress, regular bowels, absence of muco-membranous casts, and greatly improved general health. The tongue, which was improved from the first treatment, lost its coating and the red, irritable condition of the sides and tips after the second treatment.

“ From six to eight applications were made in these cases, with from 10 to 30 ma.'s of current, the quantity of water varying according to individual tolerance from one pint

to three quarts. The average séance was ten minutes in length."

Prerequisites for, and Limitations of, the Hydro-electric Method.—The method described by Dr. Cleaves above requires a good electric outfit, including a milliamperemeter, and, besides, the physician's office where it is to be carried out must be in close proximity to a toilet room; but given all these prerequisites and the necessary technical skill on the part of the physician, the mode of treatment yields often very gratifying results.

In a number of obstinate cases dependent upon chronic colitis, I have found the hydro-electric method very effective, though exceptionally troublesome. When patients can command the services of a thoroughly expert masseur, and can have in addition full doses of the continuous electric current passed through the abdomen from side to side, equally good results can usually be obtained. In all cases, however, great stress must be laid upon the diet. No method of treatment will succeed in effecting permanent cures in such cases unless the patient can be induced to change his habits of living and follow the rules of hygiene strictly in all respects. Provided the diet is sufficiently laxative and enough exercise of the body muscles is taken daily, almost any of the forms of electricity applied externally are usually effective in overcoming constipation, particularly with the help of good massage, except when the constipation is due to a spastic condition or some mechanical obstruction. There is one objection to the long-continued use of water or any watery solution in the bowel, whether accompanied by electricity or not. This is that thereby the peristaltic apparatus is accustomed to a preternaturally strong stimulus, and there is thus danger that afterward the mere stimulus of the presence in the intestines of feces, which should normally be sufficient to produce evacuations, may fail to excite them. The introduction of water or of hydro-electric currents into the colon should therefore be strictly limited to cases in which there is a chronic catarrhal inflammation, which there is hope

of curing by such means within a few weeks, and then with the intestinal mucosa left in a normal state, it is often possible to bring about natural evacuations by simple hygienic means, including at first a specially laxative diet and an unusual amount of exercise of the abdominal muscles.

LECTURE XXVII

OTHER DIRECT METHODS OF TREATING THE INTESTINES

THOSE of you who have had most experience in practice cannot fail to have noticed that medicines, especially when given by the mouth, usually fail to accomplish much in the treatment of chronic intestinal diseases, whether they take the form of constipation simply or of chronic enteritis with frequent alternations of constipation and diarrhea, and in either case a plentiful array of nervous symptoms which yield to no kind of therapy until the underlying cause has been removed. You should not be surprised, therefore, at the number of unusual methods which have been devised to remedy these complicated and always stubborn conditions. I am acquainting you with the technique of the more effective of such methods, most of which seem to have proved remarkably successful in the hands of those who devised and have become expert in the use of them, though other clinicians, who are not so expert with them, have often been less fortunate in getting good results.

Carbon Dioxide in Diseases of the Rectum and Colon.—Dr. A. Rose¹ of New York strongly recommends the use of injections of carbonic acid gas into the rectum for ulcers, fissures, and catarrhal affections of the rectum as well as for ulceration or catarrh of the colon. Rose thus describes his method of disengaging and administering the gas:

“I have tried and have suggested carbonic acid gas inflation of the rectum in enteritis membranacea, and in the few cases I have thus far treated in this manner the results have been gratifying, but I am not prepared to publish my observa-

¹ *Int. Med. Mag.*, October, 1902, p. 617.

tions, because none of these cases could be diagnosticated as pure enteritis membranacea. One was complicated with general neurosis, spasm of the pylorus and morphinismus; in another there existed well-pronounced splanchnoptosis; and in none of these cases was the treatment confined to the application of carbonic acid gas alone. However, from theoretic reasons, we are justified in giving the carbonic acid inflation a trial in enteritis membranacea.

"In the course of time I have experimented with different kinds of apparatus, and afterwards I have fallen back upon the one I first made use of, because it has the advantage over the others that it can be easily improvised, as a rule, with the aid of a nearby druggist. It consists of a bottle holding a pint or a little less, with a wide neck and a rubber stopper perforated



FIG. 42.—Rose's apparatus for generating carbonic dioxide.

so as to admit a tube, with a nozzle, as the case may be, for nose, rectum, or vagina. (See illustration.) A solution of about six drams of bicarbonate of soda in about six or eight ounces of cold water is introduced into the bottle, and four drams of *crystallized* tartaric acid (if pulverized acid is used the development of the gas goes on too rapidly) are added. The larger these crystals are the better. Instead of the tartaric acid crystals, disks of acid sulphate of soda may be used. The bottle is then closed, and the carbonic acid developing in the water rises through the tube, the nozzle of which has been placed in position. The form of gas generated serves quite well to apply the gas to the

nasal cavities, to inflate the rectum, and in some instances it can be used to give vaginal gas douches. Gas develops during about ten to twelve minutes. Its disadvantage is that the current of gas can neither be regulated nor interrupted, but in case this should be desirable, we may attach a reservoir in the shape of a rubber bag in which the gas is made to enter and from which the flow can be regulated at will.

"A few seconds after the gas enters the rectum there is produced a sensation of warmth, then a slight desire to evacuate the bowel, which immediately passes away. In patients who avoid pressure and control the levator there is no voiding of gas, the muscular closure sufficing to retain it, except after the intestine has taken up to its full capacity. The abdomen gradually becomes expanded and, when the patient begins to complain of tension, the administration is discontinued, or the patient is at liberty to void the gas. After the gas, or a certain amount of it, has been voided, the inflation may be resumed. As a rule, I continue inflation with or without interruption for about five minutes; patients accustomed to the procedure may endure it for a somewhat longer time. Carbonic acid gas may be employed then with perfect impunity. When the inflation is carried out *ad maximum* the lower part of the abdomen becomes expanded, the abdominal walls are under great tension, but, notwithstanding, the liver is not at all, or only very slightly, pushed upward; on percussion over this organ the dullness remains about as before; there is no raising of the diaphragm, consequently no retraction of the lungs; no dyspnoea is observed; no cyanosis. Persons experimented on may complain of disagreeable tension of the abdominal walls, but even this unpleasantness disappears more and more as the patient becomes accustomed to inflation."

Turck's Colonic Treatment.—Professor Fenton B. Turck of Chicago advocates the use of what he denominates "pneumatic massage" for the colon as well as for the stomach. He describes the procedure as follows:

"In one of the experiments quoted above of Meyer and

Prebriam, attention was called to the effect upon the heart and circulation by distention of the stomach with air. If the distention continues, a fall in blood pressure occurs, and collapse may ensue, but I have found that after distending the stomach or colon, if the air is allowed immediately to escape through the tube, the blood pressure will not only return to normal, but there results a marked improvement in the circulation. This

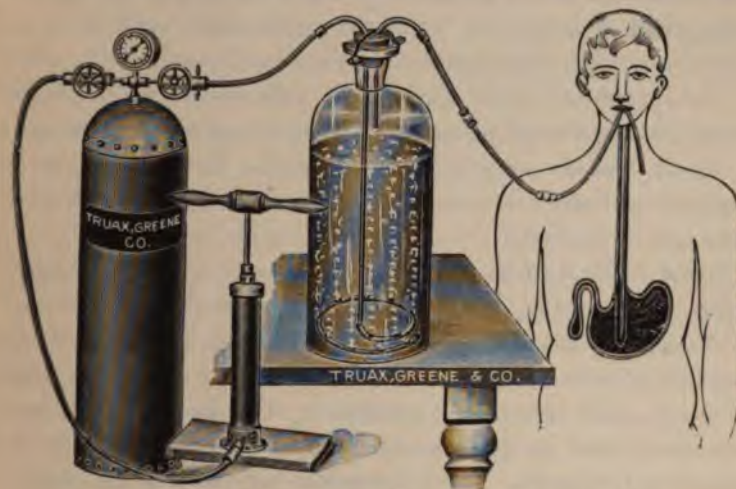


FIG. 43.—Turck's apparatus for pneumatic gymnastics.

improvement is not confined to the walls of the stomach or colon, but influences all the abdominal vessels. I therefore adopted the use of air instead of water, as a form of exercise for the stomach and colon, to which I gave the name 'Pneumatic Gymnastics,' and 'Gymnastic Massage.'¹

"The method is very simple. The air is forced into the stomach or colon through the introduced double or single soft rubber tube, preferably the double tube. Either an atomizing

¹Turck, Methods of Diagnosis and Therapeutics, *Jour. Amer. Med. Assoc.*, June 22, 1895; *ibid.*, *Am. Med. and Surg. Bull.*, July 1, 1895; Modern Methods of Treatment of Diseases of the Intestines, *N. Y. Med. Jour.*, March 13 and 20, 1897; Pneumatic Gymnastics, *Brit. Med. Jour.*, October 28, 1895, p. 1328.

bulb or the air from a compressed air tank is used. As I previously stated (*Jour. A. M. A.*, June 22, 1895) 'the introduction of the air distends the stomach and contraction forces the air out through the other tube, so that we have a pneumatic massage.' I have called attention, not only to this method of treatment of the stomach, but also of the colon as follows (*Amer. Med. and Surg. Bull.*, July 1, 1895): 'By the introduction of air through one tube and its exit through the other tube, it acts as a "pneumatic massage" and does not stretch or overdistend the already weakened organ. The effect of the treatment is also immediate, and two weeks will often show a marked improvement. It may be used in the stomach or colon, and the nebulized cloud can be forced into the intestines; and when hydrogen gas is used, the whole intestinal tract can be treated.'

"The method of using heated air, moist or dry, and medicated when desired, I have repeatedly shown is an additional advantage in this method of pneumatic gymnastics of the stomach or colon. Steam or vapor introduced at a temperature of 55° C. is a vaso-motor stimulant. Gas and air have been previously used in the stomach and intestines, principally for diagnostic purposes. Von Ziemssen was among the first to advocate the use of CO₂ for distending the stomach and colon to facilitate examination. Senn used hydrogen gas for the purpose of locating intestinal perforations. CO₂ introduced into the stomach has also been used for its therapeutic effect, and H₂S forced into the intestine was supposed to possess medical properties. The intestines have been inflated for therapeutic purposes to overcome obstruction.

"But the pneumatic gymnastics which I have advocated is an entirely different procedure, and depends upon a different principle. The pneumatic gymnastics of the colon may be combined with abdominal massage (when not contra-indicated), which helps to force out the air. This improves the circulation at once. It is especially indicated in atony associated with constipation."

Turck's Method of Doing Lavage of the Colon.—Turck is also a strong advocate of the injection alternately of hot and cold water into the colon for the purpose of stimulating the circulation in the whole splanchnic area and has in many cases undoubtedly produced excellent results in this way. To obviate the irritation which water and most medicated solutions are liable to produce in the bowel he employs an infusion of slippery elm, which is not only soothing, but has been found by him to be a poor culture medium for germs. The same infusion he recommends for lavage of the stomach also.

Flushing of the Colon.—The practice of washing out the colon by the injection every day or every other day of large quantities of warm water, several quarts or even gallons in some cases, while a valuable resource sometimes for emergencies, is most injurious in its effects when long continued or regularly depended upon for the evacuation of the bowels in chronic constipation. I cannot warn you too strongly against this fad, which was introduced into use in this country many years ago by a layman, and for a time vaunted as an extraordinary means of promoting health and longevity. I know of no more certain means of causing an obstinate form of constipation with finally dilatation of the colon. It is, however, an effective method of unloading quickly the bowels when these have long been neglected—*i. e.*, as a preliminary to more rational methods of treatment. In chronic colitis, too, a moderate flushing of the colon, with medicated solutions for a limited time, will often prove effective in modifying the catarrhal process. I have seen good results from the use of the following prescription for two or three weeks at a time, together with abdominal massage and other appropriate treatment:

R Acid. carbol.....	3 iss
Glycerin.....	3 iii
Listerin q. s. ad.	3 vi

M. S. Two tablespoonfuls in two quarts of cool or tepid water by enema every other night.

Dr. Deardorff¹ of San Francisco, who first suggested the above prescription, advises that such an enema be employed every alternate evening for a few weeks and that the bowels be evacuated by means of an enema of the normal salt solution on the other evenings. A better way is to rely upon the injection of two to six ounces of cottonseed oil to secure evacuations on the nights when the medicated enema is not used. Indeed, since I have learned the great value of even quite small doses per rectum of any one of the bland vegetable oils in overcoming constipation when persevered with for weeks or months, if necessary, and carried out in connection with a suitable diet, gymnastic movements and some mechanical measures for the stimulation of the nerve centers and muscular apparatus concerned in defecation, I find that these are generally all-sufficient for the cure of the milder cases of constipation, with very little medicine introduced at either end of the alimentary tube.

Technique of Administering Oil Enemas.—This method, which comes to us from Germany, has a very large weight of authority in its favor and is as harmless as it is effectual in not only relieving both atonic and spastic constipation, often unaided, but in finally curing it, when the patient will eat, drink, exercise, and live in all ways hygienically, though in stubborn cases other measures are valuable auxiliaries. Let the patient have ready prepared before undressing at bedtime two ounces (or more at first if necessary) of either olive or cotton-seed oil in whatever form of syringe he can introduce into the rectum most easily—a soft rubber fountain syringe is best when a large quantity must be used, and for a novice, who would be apt to irritate the rectum with a hard rubber one having the usual piston arrangement, but the latter will be most convenient for one who is fairly expert in such matters and needs to use a small amount of the oil only. Then, when fully ready to retire, let him lie down on the left side with a pillow under the hips and slowly inject the oil, being careful to lie quietly in

¹ *Int. Med. Mag.*, May, 1899, p. 354.

the same position till all desire to evacuate the oil has ceased. After lying on the left side for half an hour or so he should turn, and thereafter during the night lie mostly on the right side. At first it may be desirable to keep a folded towel against the anus during the night to prevent the bed's being soiled, but persons having a normally tight sphincter will not find this necessary. When there is a persistent pressure to have the enema expelled it may be because of impacted feces in the rectum, which should be removed by one or two thorough colon flushings in the beginning of the treatment. If, in spite of this precaution, the oil will not remain in the bowel during the night, it may be advisable exceptionally to employ a long soft rubber rectal tube with which to introduce the oil, and have your personal assistance in passing it well up into the colon where, with care to see that the patient lies for some time on the right side after retiring, it will be sure to give no further trouble till it comes away in the morning with a soft or normal evacuation of feces—often a copious one. You should carefully direct the patient to let the injection of the oil be the very last thing done before getting into bed, since, when he is obliged to get up and go about the room afterward, the oil may not be retained.

LECTURE XXVIII

VIBRATION, MANUAL THERAPY, AND OTHER MECHANICAL FORMS OF TREAT- MENT

MECHANICAL vibration is an old method of general and local stimulation which has been much employed in the larger institutions such as that of the government in Baden Baden, in the numerous Zander institutes of Europe and America, and in some of the principal sanitariums of this country. Lately ingenious forms of apparatus have been devised and put upon the market for the purpose of more conveniently regulating the application of vibration to the spine, joints, and other regions and cavities of the body, including the rectum, vagina, etc. There is so far less literature upon this subject than could be desired, but I believe that in the future the method will be more thoroughly studied and found, for application in certain localities of the body, superior to stimulation by means of electricity.

The late Dr. Maurice F. Pilgrim of New York, a former vice president of the American Electro-Therapeutic Association, and therefore, presumably an expert in the therapeutic uses of electricity, recently wrote a book on "Mechanical Vibratory Stimulation."¹ He was a very enthusiastic advocate of the method, giving it the preference over electricity in many cases for which local or general stimulation is indicated.

The recent investigations of physiologists demonstrating that vaso-constrictor and vaso-dilator nerve fibers pass out from the spine with the various spinal nerves and go finally to control the caliber of the smaller arteries and arterioles in

¹ "Mechanical Vibratory Stimulation," by Maurice F. Pilgrim, M. D., New York, The Lawrence Press, 110 Fifth Avenue.

the periphery and the viscera have afforded an apparent scientific basis for all the forms of local stimulation, especially over the regions on either side of the spine, which before rested merely upon empiricism. Hence the greatly increased activity and zeal displayed now in the propagation of such methods. I have been the more willing to put to the test the claims made in behalf of vibratory stimulation from the fact that it is almost identical in principle with the vibratory movement in hand massage, only capable of more delicate and varied as well as more vigorous and sustained application, and very similar to the stimulation produced by electricity which I have been applying to the spine, as well as to the other parts, for twenty-five years with excellent results. Moreover I studied the effects of mechanical massage, including vibration as formerly employed in a cruder way in Baden Baden in 1885 and in the Battle Creek Sanitarium in 1893, and then received a favorable impression as to its value. It possesses some real advantages over other forms of mechanical treatment now that apparatus for applying it has been so perfected that it can be conveniently and effectively employed in any office which is in connection with an electric light plant. By means of some of the improved instruments for applying vibration, especially that made by the Vibrator Instrument Company of Chattanooga, Tenn. (see illustration on p. 306), treatments varying in force, as well as in the length of the vibratory movement, can be given conveniently and effectively to any external part of the body and to several of the accessible cavities. Dr. Pilgrim says:¹

THE ADVANTAGES CLAIMED FOR MECHANICAL VIBRATION

“Treatment by mechanical vibratory stimulation has been found by practical experiment to be capable of:

“(1) Increasing the volume of the blood and lymph flow to a given area or organ;

¹ *Ibid.*, p. 15.

- " (2) Increasing nutrition;
- " (3) Improving the respiratory process and functions;
- " (4) Stimulating secretion;
- " (5) Improving muscular and general metabolism, and increasing the production of animal heat;



FIG. 44.—A vibrator.

- " (6) Stimulating the excretory organs and assisting the functions of elimination;
- " (7) Softening and relieving muscular contractures;
- " (8) Relieving engorgement and congestion;
- " (9) Facilitating the removal through the natural channels of the lymphatics, of tumors, exudates, and other products of inflammation; relieving varicosities and dissipating eruptions;
- (10) "Inhibiting and relieving pain."

The method is especially applicable in atony of the stomach

and intestines both secretory and motor, and the stimulation can be advantageously applied either directly in front over the abdomen or to the corresponding areas on either side of the spine.

By this means, too, it is possible to stimulate the pancreas through the stomach.

Manual Therapy is a more recent candidate for favor in the same general field of mechanical treatment. It is really a mild form of massage performed with unusual care and precision. The term has been applied to the treatment by means of digital pressure over the lymphatic glands and on the points of emergence from the cranium and spinal column of various nerves which have been demonstrated to include vaso-motor fibers distributed to the blood-vessels supplying the different peripheral and visceral regions of the body. The claim is made that such pressure may be so applied as to either contract or dilate the vessels in various parts of the body, and this, if it could be confirmed by clinicians generally, would be a most useful discovery, since it is so much more simple than the other methods of applying stimulation along the spine.

The somewhat limited experiments which I have seen made with it by those most familiar with the method have not convinced me that it is anything like so efficient as either electricity or mechanical vibration applied over the same regions; nevertheless numerous cures by means of it are claimed by its votaries, and the method is deserving of the fullest investigation.

It is said to be extensively employed by the osteopaths in connection with the ordinary routine massage, Swedish movements, and other manipulations. There has been up to the present time almost no scientific literature upon the subject with detailed reports of cases upon which one could base an adequate judgment of the method; but Dr. John P. Arnold has recently contributed to the *International Medical Magazine*¹ a series of papers in which he has considered quite

¹ *Int. Med. Mag.*, for May, July, August, 1903.

fully the anatomic and physiologic foundations for such a method of treatment, and reports gratifying results in a large number of cases treated by him in this way. One fact pointed out by him, as well as by Pilgrim in the book previously cited, is that in many neurasthenics as well as in numerous other patients affected with disease in some of the thoracic or abdominal organs, a peculiar change can be recognized by the touch in the muscles alongside the spinal vertebræ corresponding to the origin of the nerves supplying the affected part.

By allowing the patient to lie down upon one side, while you feel along the upper side of the spine gently with the tips of the fingers, you may detect frequently instead of the normal soft mass of muscular fiber running parallel to the spine on either side, a cord-like structure which feels hard and tense under the fingers. Whenever such a cord-like band can be felt there is said by Pilgrim to be a contracted or possibly atrophic state of the tissues beneath, and usually the patient finds palpation over such a place more or less painful. Frequent treatment of these morbidly affected parts by mild electric applications, or by mechanical vibratory stimulation (perhaps also by manual treatment), will often remove the abnormal condition and at the same time the unusual sensitiveness to pressure with simultaneous improvement in the condition of the organs or parts supplied by the nerves arising from the adjacent parts of the spinal cord.

Counter-Irritants.—The actual cautery, blisters, rubefacients, wet and dry cupping, etc., have been in use since the earliest times as means to modify the blood supply of parts directly underneath or adjacent to the site of application. The fact that they occasionally influence the circulation in more distant parts has been frequently observed, as when hyperæmia of the brain or pelvic organs has been lessened by immersing the feet in hot mustard water. Such effects have doubtless been due in part to a reflex stimulation of the vaso-motor centers and in part only to a direct derivation of an excess of blood from the part to which the application is made. Counter-irritants can

be made highly useful as palliatives particularly, in various gastro-intestinal affections; and the remedy which can only palliate in stubborn chronic conditions can often cure the same when of recent origin.

Heat and Cold.—These agents act in much the same way as the foregoing, and are of even wider applicability. The great value of ice packs to the abdomen in peritonitis and appendicitis need not be dwelt upon here. Hot wet packs applied over the epigastrium or lower abdomen also exercise a powerful sedative influence upon the circulation in the viscera underneath. These agents might have been more appropriately included under the head of hydrotherapy, except that they are not always applied in the form of water or ice or the vapor of water. Dry heat in the form of hot air, hot bottles, and hot bricks is often used for the same purpose, but usually is not nearly as efficacious as the hydriatic methods of applying it.

Hydriatic Procedures.—Numerous volumes have been written upon the various forms of hydrotherapy, and it will be impossible to go deeply into so large a subject in this connection. Suffice it to say that we have few more powerful means of influencing the circulation and nutrition in any part of the body, including of course the digestive organs, than by a skillful use of water and the various hydriatic applications. I shall have more to say to you about this under the head of the different diseases to be discussed in subsequent lectures, and an abundance of literature is accessible upon the subject, including especially the works of Dr. Simon Baruch¹ and Dr. J. H. Kellogg² in this country.

Phototherapy, or the Finsen Light Treatment, does not seem to be well adapted to gastro-intestinal affections, except that exposure of the body to the sun's rays has been found tonic and restorative in adynamic conditions generally; but there is apparently no good reason why the sun's rays should not

¹ "Uses of Water in Modern Medicine," Detroit, Geo. S. Davis, 1892.

² "Rational Hydrotherapy," J. H. Kellogg, F. A. Davis Co., Philadelphia, 1901.

be concentrated and reflected into the rectum for the treatment of hemorrhoids and rectal ulcers as well as for ulceration in the larynx or disease of the cervix uteri.

Similarity of the Effects of the Different Mechanical Methods.—Most of the mechanical modes of treatment tend to produce like effects. Electricity, hydriatic procedures, exercise in the form of special gymnastic movements and massage both manual and mechanical, the former including all the forms of manipulation and pressure over the spinal nerve origins and over the lymphatic as well as other glands, and the latter, especially vibratory stimulation over the same important regions, are different means of exciting to more vigorous, or at least more healthful, action (1) the great lymphatic system with its vitally important eliminative function, which is often sluggish in its work in sedentary persons, or congested and blocked by an excess of detritus from neighboring abscesses, inflammatory exudates or, more exceptionally, malignant growths undergoing resolution as a result to x-ray treatment; (2) the vaso-motor system of nerves and the intimately associated sympathetic chain of ganglia which dominate the blood supply and secretory and excretory work of all the viscera, including especially the digestive organs as well as the blood supply of all other parts of the body; (3) the secretory glands of the abdominal organs through the stimulation (or inhibition in certain cases) by mechanical vibration, manipulation, or electric applications along the spine, of secretion in the different viscera by means of which, in the case of the liver and intestines, with the help of stimulation also of the peristaltic apparatus, more thorough evacuations of the bowels can be effected and constipation often be cured; (4) the muscular system generally by direct local excitation as well as through the nerves supplying the muscles, thus increasing the development of the latter and augmenting their vastly important work in metabolism, heat production, etc.; (5) the skin, the activity of the circulation and sweat glands of which is essential to the healthy functioning of the digestive organs; and

(6) the kidneys, the chief emunctories of the body, any interference with whose action not only seriously embarrasses digestion, but also endangers life itself. Abundant physical exercise alone in the hardy laborer, whose work is out of doors, accomplishes all these results without care or forethought. Massage, if sufficiently vigorous and frequently enough performed, will also go far toward maintaining all the functions in a healthy state, or restoring them when disturbed by minor derangements. Hydrotherapy will keep the skin active and healthy and invigorate the circulatory and nervous systems often better than any other curative measures, when none of the organs are seriously diseased, but though usually helpful in nervous dyspepsia, generally fails when depended on alone to remedy structural disease in the gastro-intestinal tract. The various forms of electricity and the newer developments in vibratory stimulation I have already seen accomplish results which make me hopeful that in the future great things may be expected of them in remedying even many of the more serious digestive troubles. Much is claimed also for the treatment of such cases by manual or digital pressure over the spine and elsewhere, and fair-minded clinicians will wait expectantly for developments in this line. It should be very gratifying to all sincere friends of progress in the beneficent art of healing to know that so much can already be done and that so much more is promised by means which lessen our dependence upon drugs.

LECTURE XXIX

INTRAGASTRIC METHODS OF TREATMENT—LAVAGE, INTRAGASTRIC SPRAY, ETC.

When and How to Wash Out the Stomach.—The “when” involves these questions: (1) in what cases, (2) how often, and (3) at what time of the day. The first is the most difficult to answer. Lavage helps many cases in a most striking manner. In others, apparently similar, it fails and may do harm. Sidney Martin, while bearing testimony to its great benefit in certain conditions, says: “The method of treatment has been much abused and must be applied with circumspection.” Ewald hit the nail on the head in his paper before the British Medical Association when he cautioned against the “too long continuance and too frequent employment of washing out the stomach,” adding that “when it does good, it does so very soon.”

The tube is far more valuable for diagnosis than for treatment. In all your cases of indigestion and often in neurasthenia, constipation, insomnia, and especially in stubborn headaches, you would do well to ascertain, by means of an analysis of the stomach contents under varying conditions, exactly what sort of work the organ is doing as to its secretory function, and also gain full information about its even more important motor function.

When such tests show a large amount of mucus, you may suspect gastric catarrh, and in most cases of chronic catarrhal inflammation *of the stomach itself*, lavage will do good; in many of them it is almost indispensable.

More often the mucus comes from the parts above, having

been swallowed, and the diagnosis of chronic gastric catarrh, which many physicians attempt to make offhand, frequently presents difficulties, even with the help of chemical and microscopic examinations of the stomach contents. But this subject will be considered in a subsequent lecture.

The most imperative indication for lavage is gastrectasis, or dilatation of the stomach, whether resulting from narrowing of the pyloric orifice (cancer or other tumors, or the cicatrix of an ulcer), from a kink of the small intestines (which may follow displacement of the stomach, colon, or right kidney), or from atony of the muscular walls of the organ. Whatever the cause, dilatation, when neglected, tends to become a serious condition, and lavage judiciously done is an aid to the cure in the atonic cases, while it is a most valuable palliative in the desperate ones, until operative relief can be obtained.

In bad cases of gastric catarrh and in patients not too reduced in strength, provided all the results are encouraging, it will be proper to wash out every day at first, until the amount of mucus is markedly lessened. This will be the more advisable if the microscope shows the presence of numerous yeast fungi or sarcinæ in the wash water. As the conditions improve, or sooner if the patient should fall off in flesh, tone, or appetite, prolong the intervals, until by the end of a month, once a week may be often enough.

When the treatment has been begun early and is properly carried out, you will often succeed in removing all the symptoms and signs of gastritis in one or two months; but in very advanced or debilitated cases you will need to be guided by the effects, and sometimes in such cases, with dilatation dependent upon a mechanical obstruction of the outlet, a radical cure is not practicable. The best that can be accomplished then, under ordinary conditions, without operative interference is palliation, and for this you may find it useful to cleanse away the accumulated mucus and bacteria, at least once a week during the remainder of life.

Best Time for Lavage.—In nearly all cases the best time for lavage is before breakfast. At this time remains of digested food are very rarely found in the stomach to be washed away and lost to the system, except in the worst cases of dilatation. It is a most inconvenient hour for the physician, but it is usually practicable to have nurses trained so as to do the work with all necessary skill. A good nurse can report intelligently as to the macroscopic appearance of the wash water, and in all important cases she should from time to time save samples of it for microscopic examination—a little of the first brought up for examination as to the amount of mucus and presence of bacteria, and some of the last to be tested as to the presence of degenerated epithelium from the gastric mucous membrane. My own custom is to employ the electric centrifuge to obtain a concentrated sediment for this purpose.

Many good authorities advise that lavage be done at bedtime when fermenting food in the stomach prevents sleep. This may exceptionally be useful, especially in cases of gastralgia, but diseased stomachs are rarely empty at bedtime and experience teaches that, as a continuous practice, washing away half-digested food is disastrous. When severe fermentation cannot be otherwise controlled, it would be better to feed less by the stomach and help out by nutritive enemas.

How to wash out: The way to introduce the tube is fully described in Lecture VII. Don't procure any of the complicated apparatus for lavage you will see described in the books. They are all troublesome and unsatisfactory. Lavage, according to my experience, is best carried out with a simple soft rubber stomach tube, in size about No. 32 of the French scale. It should be provided with an opening directly in the end and with one large opening about half an inch above. It is also advisable to have a number of openings about pin-head size near the end so as to produce a sprinkler effect upon the walls of the stomach when the fluid is poured in and also to insure a continuous return flow in spite of the

possible blocking of the larger openings by pieces of food. The tube should be about four and a half feet long and have fitted into its upper end a large glass funnel, when to be used for the purpose of lavage, and a bulb in the course of it helps to keep it clear. It is also desirable to cut off about one foot of the upper end and insert a piece of glass tube four inches long to serve as a fenestra, so that you may observe when the water is flowing in or out without interruption. The tube should be made of highly polished rubber and should be discarded whenever cracks have occurred in it, since these are liable to irritate some portion of the mucous membrane. After use the tube should be thoroughly cleansed with hot water and afterward allowed to stand for some time in a 5 per cent. solution of formalin in order thoroughly to disinfect it. If you have not analyzed the stomach contents and do not know whether hydrochloric acid is deficient or in excess, it will be safer for you to use tepid or warm (not hot) water which has been sterilized by boiling, with bicarbonate of sodium dissolved in it to the extent of one or two teaspoonfuls to the quart. If the treatment should be continued longer than a month, and you remain in ignorance as to the gastric secretion, it will be best to omit even the soda after that time and wash out with boiled water only. If an analysis has shown that you are dealing with an acid gastric catarrh (in which the glands secrete an excess of HCl and the ferments as well as of mucus) you can dissolve a tablespoonful of soda to the quart of water and go on with this for a long time, provided the hyperacidity persists and the patient is improving in nerve tone. But don't mistake the familiar sour stomach of fermenting carbohydrates for hyperacidity from an excess of HCl. In the former condition the prolonged use of alkalies is very hurtful.

When there is a marked deficiency of HCl, the water may be hotter and table salt, from a teaspoonful to a tablespoonful, may be added to each quart. Exceptionally, stronger anti-septics or astringents may be used. The most serviceable I

have found to be alum, one-half teaspoonful, and nitrate of silver, one or two grains, to the quart. Strong HCl, a half



FIG. 45.—Lavage of the stomach. Inserting the tube.

teaspoonful to the quart, will often answer well, when there is a marked deficiency of gastric juice.

Many other drugs, including boric acid, salicylic acid, tannic acid, resorcin, and alumnol are employed in this way, but a few of them, and especially the stronger ones, are liable to have an injurious action when continued long. It is a safe rule and one which I try to follow, never to use for lavage more than four times as much of any drug as could be safely le

to absorb, since one-fourth will often pass into the bowel and be absorbed.

The tube with the funnel inserted in it having been introduced, the solution, previously prepared and placed in a pitcher



FIG. 46.—Lavage of the stomach. Pouring the solution into the funnel.

at hand, is poured in, a pint or quart at a time. Just before the last of the water has disappeared from the funnel the latter should be carried quickly down toward the floor and held in the upright position over a pail. By siphonage the liquid now flows back into the funnel, where it may be inspected

before emptying. One quart of water is quite as much as most patients will care to have used at the first washing or two, but later you should gradually increase the quantity, until finally several quarts, or enough to cleanse away all the mucus, may be introduced, but not more than one quart at a time, and in some very weak stomachs a pint at a time will be more advisable. Be careful always to get out again all the water you put into the stomach, especially when medicated, or at least as much of it as has not passed on into the duodenum.

A practical wrinkle, which I have found to lessen considerably the time required to loosen and detach all the mucus in old gastric catarrhs, is to have the patient drink a tumbler or two of warm water before taking the tube, and then, lying down on the back, make voluntary contractions of the abdominal muscles so as to splash the water around in the stomach for three to five minutes. When this is done, scarcely one-half the usual quantity of water is required in the washing out which follows directly afterward.

Delicate patients should be allowed to rest in the recumbent position half an hour at least after lavage, and in no case should a meal be eaten within that time after the procedure.

The Intragastric Douche and Spray.—Various devices are in use, both in Europe and in this country, as substitutes for



FIG. 47.—Turck's stomach sprinkling tube.

lavage. These include what are virtually stomach tubes with numerous small openings at the end, through which water or any medicated fluid can be forced in fine jets so as to cleanse the walls of the viscus and either stimulate or, in suitable cases, soothe and medicate them. Turck employs for this

purpose what he calls the sprinkling tube or needle douche, an illustration of which is here given.

It consists of a double tube, the shorter of which has its lower end perforated with numerous small holes. When water is forced in through this tube, either by elevating the reservoir some twelve feet high or employing a force pump, the mucous membrane of the stomach should be effectually cleansed by the numerous fine jets impinging upon it. Turck claims that when hot and cold water are used alternately— 115° to 45° F.—the action is that of a powerful vaso-motor stimulant. The longer tube serves for the outflow, keeping the stomach empty. This is a useful apparatus.

Einhorn has invented a special apparatus for spraying the inner walls of the stomach with medicated solutions, claiming

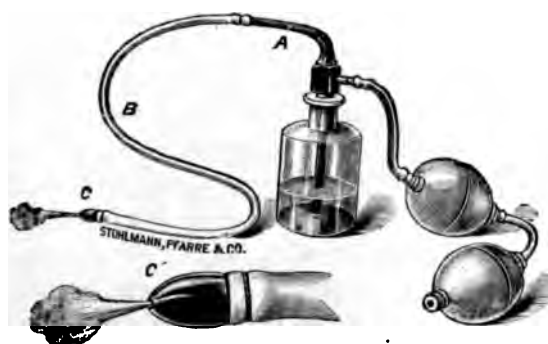


FIG. 48.—Einhorn's intragastric spray apparatus.

that, on account of the very much smaller dose of any toxic agent thus required to medicate the whole mucous membrane, the risk of a poisonous effect is avoided.

He employs the ordinary spray apparatus, except that between the bottle and terminal spraying nozzle a sufficient length of a small soft tube is inserted to extend from a convenient point outside the mouth to the interior of the stomach. Air is then forced through the apparatus in the usual way by

compression of a rubber bulb with the hand. This has a less cleansing effect than either lavage or Turck's needle douche, but affords a very useful means of disinfecting or otherwise medicating the mucous membrane of the viscus. The spraying is only effective when the stomach is empty, and, if necessary to secure this condition, lavage should precede it.

LECTURE XXX

INTRAGASTRIC METHODS, CONTINUED— INTRAGASTRIC ELECTRICITY

THE most strikingly favorable results I have observed from any form of instrumental treatment in the stomach have been from the use of faradism with an electrode inside the viscus. The direct application of electricity to the stomach from within is entirely practicable with the instruments now obtainable, and it may surprise some of you to learn that it is an even simpler procedure than lavage. Notwithstanding some statements to the contrary, during the past fifteen years there has accumulated a large array of evidence, both experimental and clinical, in this country and elsewhere, to the fact that direct electrization of the stomach through an electrode within the viscus, the current being completed by the application of the other pole either to the back or the epigastric region, can cause contractions of its walls and a diminution of its size. There is clinical testimony also from a number of observers to the fact that the innervation and secretory function of the stomach can be powerfully influenced in the same way.

As Simple as Lavage.—Lest it be inferred that the method must be complicated and difficult, one, therefore, which could have only a remote interest for general practitioners, let me say to you, and emphasize it as strongly as possible, that intragastric electric treatment is at least as simple as lavage, producing even less strain upon a weak or nervous patient, and for persons accustomed to the tube, unless in a case of gastric ulcer or cancer for which it is wholly unsuited, is by no means so dangerous in its possible consequences, when wrongly used, as are drugs recklessly and unskillfully prescribed.

This is so true that, with the instrument and method now employed for this purpose in my practice, I not only advise family physicians how to overcome atonic conditions and dilatations of the stomach by this means, but also instruct nurses, and in exceptional cases even the relatives or friends of patients, so that they can administer the treatment safely under my general supervision.

This means, of course, that the method has been much simplified since the earlier experiments with it. Dr. Charles G. Stockton of Buffalo was the first in America to employ electricity in this manner, having begun using it in 1887. He devised a very ingenious electrode, which he has continued to use up to the present time with excellent results. It was fully described in a paper by him in 1891.¹

He has seen markedly curative effects in cases of stomachs with weakened or apparently absent motility, in gastric dilatation, catarrh, atrophy and in "some in which the hydrochloric acid existed in excess."

Intragastric Electrodes.—For several years the intragastric electrode devised by Einhorn was employed to some extent in my practice and occasionally with strikingly good results, especially in a few cases of very marked dilatation without pyloric stenosis. Some difficulty, however, was experienced in introducing it into the stomach of occasional patients on account of the considerable diameter of the terminal bulb containing the electrode and the absence of any stiffness in the cord or rheophore. Ewald obviated this in part by covering the very flexible cord with a medium-sized rubber tube fitted neatly to the bulb. Thus a very slight degree of stiffness was produced, sufficient to permit of the electrode's being gently pushed down in patients who could not otherwise swallow it. I found this modification in use in Ewald's clinic in Berlin in 1895, and brought one home with me. It rendered good service for a time till it wore out. Then recourse was had to

¹The Use of the Gastric Electrode in Diminished Peristalsis, by Charles G. Stockton, M. D., *Medical Times and Register*, November 7, 1891.

the original Einhorn instrument, and upon extending its employment to a large number of cases, including some with very nervous throats, several difficulties were encountered. The instrument resembles a large capsule with a flexible cord attached, and a few patients who were accustomed to the stomach-tube and able to take the largest-sized capsule by itself, insisted that they could not swallow one with a string to it. There was at times still more trouble in getting the electrode up again. The bulb would catch in the narrowest part of the esophagus and fail to pass through, even with the aid of deglutition-movements. Then the patient in such a contingency would sometimes grasp the cord and give it a hard tug, with the result of breaking the very fine wires inside. In these cases it was sometimes necessary to insert the forefinger down behind the larynx, disengage the electrode and draw it out.

An illustration of the original electrode invented by Professor Einhorn, and largely used in all parts of the United States, is herewith shown.

I have had this instrument modified so as to render it easier both to introduce and to withdraw, and now rarely have any difficulty in administering electricity directly within the stomach.

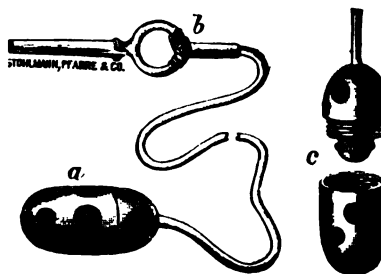


FIG. 49.—Einhorn's intragastric electrode.

Great credit is due Professor Einhorn for originating his very serviceable electrode, and I do not claim any for so modifying it as to make it better suit my needs; but the fact that the modified instrument is in some respects an improvement on the original would appear evident from the description of the original just given with that of the modification which follows, as well as from the accompanying illustrations of both.

Reed's Modification of the Einhorn Electrode.—In the

modification the bulb or capsule covering the bit of metal which constitutes the electrode proper is much narrower, as well as longer and more sloping at both ends, than that of the Einhorn and Ewald instruments, so that it is easier both to introduce it into the stomach and to get it out again, which is equally important. The cord is composed of spiral wire covered thinly with rubber, and has, like the Ewald electrode,



FIG. 50.—Reed's electrode.

enough firmness to enable it to be gently pushed through a spasmodically contracted esophagus, and yet is so small as not to provoke usually any marked flow of saliva. It does not prevent talking or drinking, or otherwise annoy the majority of patients during the five to eight minutes that each treatment must last. These are all extremely practical points in carrying out the method in nervous or fussy patients.

Turck's gyromele is capable of being used as an electrode, but I have not employed it for that purpose.

Boas, in his work on the stomach¹ describes and pictures an intragastric electrode which should be effective, but involves the same inconvenience usually experienced in washing out the stomach, owing to the prolonged contact of a tube of considerable size with the throat and mouth.

I have never used the Stockton electrode, but it must have distinct advantages for cases requiring a preliminary lavage.

Effect of Intragastric Electricity upon Secretion.—My experience with electricity applied within the stomach has been somewhat striking as to the effects on secretion. Besides finding it helpful in certain cases of gastralgia, and in some cases of obscure gastric pain of unknown origin, using here the positive pole of the galvanic current with a strength of 5 to 10 ma., I have found the ordinary faradic current in

¹ "Diagnostik u. Therapie der Magenkrankheiten," I Theil, S. 298.

virtually all cases of muscular atony, or atonic dilatation, decidedly beneficial and sometimes rapidly curative. The slowly interrupted current of any faradic coil with a strength just sufficient to produce contractions in the stomach, and the currents obtainable from the familiar faradic batteries in general use having coils of short, coarse wire and not of a very high power, I have found not only to improve the motility and gradually to contract the stomach, when it was enlarged, but also, as a rule, to stimulate primarily the gastric glands and increase the percentage of hydrochloric acid, in those cases at least in which the latter was below the normal without atrophy having developed.

Except in a single case reported below, I have never employed this form of faradic battery in hyperchlorhydria, considering its effect as generally tonic and stimulating. I believe that it always tends to stimulate at first and that, just as very large doses of drugs can overstimulate and depress, and moderate doses frequently repeated often do the same, so a very powerful faradic current for a short time, or even a mild one daily applied for a long time (as in Case I), can and does produce depression of the glandular function. Doubtless there is no possible dose of faradism which could rapidly depress the motor function also, since the primary effect of even the strongest current is to produce a tetanic cramp of the muscle. There is the probable danger, however, that a too long continuance of moderate currents, directly applied to the stomach-walls, would in the end by over-stimulation lower the motor function.

With a good high-tension coil it is possible to apply a much stronger current painlessly than with the ordinary coil, and too strong a current may at first cause increased secretion as is the case with the ordinary faradic current.

My experience teaches that such a coil with a long fine wire and rapid interruptions applied with one pole in the stomach and the other in the form of a large flat sponge, felt, or clay electrode, over the epigastrium, will almost uniformly, with a

proper strength of current lessen the percentage of the hydrochloric acid in the gastric juice, whether it was previously normal or in excess. In only one or two very exceptional cases has it failed to do this, and then the treatment was not kept up with sufficient regularity, nor were the patients under the requisite hygienic conditions. Having early learned of its markedly depressing effect upon the glands, I have never employed the high-tension coil in a case of deficient gastric secretion, but have learned to rely upon it of late as my sheet-anchor in stubborn cases of the opposite class, in which there is excessive secretion—hyperchlorhydria.

Action of Faradic Currents on Secretion Discovered Accidentally.—My discovery of this power in faradic currents of high intensity was accidental. While in general practice I had come to make considerable use of such currents in ovarian pain and other conditions accompanied by obscure pain or discomfort in the pelvis. For this purpose I had obtained one of Kidder's best high-tension faradic batteries and, after replacing its troublesome dry cells by an efficient Grenet cell, found it a most useful machine. When I began to make a large use of electricity in the stomach, this particular battery proved to be the most convenient and reliable one in my outfit, and so was most frequently employed. I was soon surprised to observe a rapid diminution in the proportion of hydrochloric acid in the stomach-contents of cases thus treated.

REPORTS OF TWO ILLUSTRATIVE CASES.

You may be interested in the reports of two cases which illustrate strongly the depressing influence of the high-tension faradic currents upon the gastric secretion. Very many other similar cases are recorded in my notebooks, though at present I do not employ the method so often as formerly for the reason that, with a more skillful use of antacid and sedative remedies, the *dernier ressort*, intragastric electricity, is less frequently necessary. Numerous cases which involved motor

conditions with or without dilatation have been reported by me in previous papers.¹

The first case which was treated by me with the help of intragastric electricity has been referred to briefly in a previous paper,² but shows so strikingly the great value of this method in even a very desperate condition, that a fuller account of it is now given you:

CASE I. Lady, aged twenty-two years, unmarried, was sent to me from a town in Northern New York in the year 1896, while I was in general practice in Atlantic City. She had been for years out of health in various ways. When she came under my care she had dilatation of the stomach with some gastroptosis, very movable right kidney, and catarrh of the whole gastro-intestinal tract, with extreme emaciation, prostration, and anæmia. There was excess of the gastric secretion, the free HCl being .182, and the total acidity 90. The lower boundary of the stomach was three inches below the umbilicus. The upper boundary was only one inch above the lowest rib in the left parasternal line. She was barely able to walk and was daily growing weaker as well as thinner. There was also a rise of temperature to 100° or higher, every afternoon. I put her to bed, ordered lavage and a very restricted diet with some rectal feeding, after irrigation of the colon. Tonic medicines were also administered per rectum. In spite of all this the improvement was slight, and after a time a moderate faradic current from an ordinary cheap coarse coil was applied every day with one electrode in the stomach and the other over the epigastrium. To avoid fatiguing the patient too much, the electricity was administered not directly after washing out the stomach, but at another time of the day. These various measures, except the rest in bed, were continued more or less persistently during a period of three months, after which the applications of electricity were made every second day. By the end of the three months the stomach had decidedly retracted in size,

¹ Dilatation of the Stomach, with Reports of Cases Treated by Diet, Massage, and Intragastric Electricity, *Journal American Medical Association*, July 30, 1898; and Displacements and Dilatations of the Abdominal Organs; their Relation to Faulty Modes of Dress, and Their Treatment, *Therapeutic Gazette*, September, 1899.

² "International Clinics," vol. i., Seventh Series.

the lower border being then found one inch above the umbilicus. The patient had gained many pounds in weight, was much stronger, and the proportion of HCl had steadily lessened. An examination of the stomach-contents made about ten weeks later showed an absence of free HCl and a total acidity of only 35; her improvement continued. Two years after my treatment began, though she had meanwhile returned home and reported to me at long intervals only, I found her with a good color, plump and strong. Her digestion was reasonably good with moderate care of her diet. The former loose kidney could no longer be felt, and her stomach had not only retracted within the normal limits, but had returned to its normal position.

The foregoing having been the first case in which I applied any form of the electric current within the stomach, I was inexperienced, and thought only of the very serious condition of dilatation and stagnation, with the resulting alarming failure of nutrition. I had then had a limited experience only with hyperchlorhydria, and did not realize that this condition, by producing a spasmodic closure of the pylorus, had doubtless been the chief cause of the dilatation. In making the direct electric applications to the stomach, I looked upon them as an extreme measure for combating the dangerous motor condition and did not consider the effect upon secretion. Therefore, frequent tests of the stomach-contents were not made as is my present custom in all such cases, else the percentage of HCl would not have been allowed to be lowered so far. But with the administration of hydrochloric acid and pepsin as medicines, and later tonics by the mouth, the gastric juice soon regained its normal strength.

The patient above referred to brought an invalid mother to consult me in August, 1903, and was herself then in good health, seven years after the treatment described, having gained fully forty pounds in weight.

CASE II. Widow, aged thirty-five, long neurasthenic and dyspeptic. Right kidney very movable. Stomach somewhat dilated; constipation and some intestinal catarrh. Percentage

of HCl in gastric juice excessive when patient first came under my care in 1897. The hyperchlorhydria was then soon controlled by the usual remedies, and with it most of her complaints disappeared. But there have been recurrences since, due probably to reflex irritation from the floating kidney. In March, 1899, she returned with the HCl in greater excess than ever before, and this time persistent treatment by diet, alkalies, belladonna, etc., failed to control it. Finally the high-tension faradic current was applied through my intragastric electrode six times at intervals of two to three days, with the result that the percentage of HCl came down to .051. It had been as high as .196 after the Ewald test-breakfast. I urged operation, which the patient declined. In September last she returned with marked hyperchlorhydria again, and besides, whenever we tested her stomach-contents, bile was always found present, showing probably pressure by the kidney on the duodenum below the point of entrance of the common bile-duct. She had lost much flesh and her color was very sallow. Again I tried to relieve her by means of diet and full doses of the usual remedies and, again failing, applied the high-tension current within the stomach in addition to the administration of the remedies internally. Again there was a prompt diminution of the HCl secretion to the normal.

The Technique of Applying Electricity Intragastrically.—

A few words more as to the technique of this method of administering electricity. My patients after a light, early breakfast come for this treatment not earlier than 11 A. M., and those with very sensitive stomachs and poor motility, preferably at 12 or later. One or two glasses of water, according to the capacity of the stomach, are then taken and a large flat electrode, well-wetted, applied over the epigastrium. In some cases, when, as often happens in these cases, the lower four or five dorsal vertebræ are sensitive, the flat electrode is applied over them. Then the battery being ready, the patient, while sitting on the side of a lounge or couch, swallows the intragastric electrode with a little guidance and gentle pushing, if necessary, on the part of the physician, and afterwards lies down. The current is turned on gently at first and the strength gradually increased to that which the patient

can distinctly feel, not all that he can possibly bear, since the maximum current which can be borne is very much stronger with a high-tension coil than with an ordinary faradic battery.

Five minutes of such a current every other day, I have found enough as a rule, though in stubborn cases it is given for seven or eight minutes at each sitting. More has sometimes produced harmful depression with loss of appetite, and after twelve or fifteen such treatments, if the desired result has not been sooner accomplished, it is best to intermit them for a week or two. It needs to be strongly emphasized, however, that in all cases in which electricity is applied within the stomach, especially in those in which there is hydrochloric acid excess for which a high-tension current is being used, there should be a quantitative test of the stomach-contents about every week, or, at the longest, every two weeks, to prevent the risk of injurious overaction.

A very few patients will be seen in whom no kind of intra-gastric instrument can be used without a harmful amount of disturbance. But the electrode employed by me is more easily introduced than the ordinary stomach tube and, once in position, rarely occasions any considerable annoyance. The exceptions are comprised by a small proportion of cases in which nausea is experienced when the current strength is increased beyond a certain moderate limit. In these a milder current needs to be used, and a longer course of treatment is therefore required to effect the desired result.

LECTURE XXXI

THE MEDICINAL THERAPY OF DISEASES OF THE STOMACH AND INTESTINES

IN placing this form of therapy last, I do not intend to convey to you the impression that it is of slight importance, but rather that in the treatment of the chronic affections of the stomach and intestines as well as of most chronic diseases,—it is less frequently of permanent advantage to the patient than the hygienic, dietetic, and mechanical methods already described. In many forms of gastro-intestinal diseases, particularly in gastric ulcer, and all the derangements associated with marked hypersecretion of the HCl of the gastric juice, diarrhea, intestinal colic, etc., certain drugs can prove extremely efficacious, especially in the beginning of the treatment. I shall not attempt here to specify all the drugs which may be useful in treating gastro-intestinal diseases, but rather to refer to the various classes of remedies, specifying particularly such of them as I have found in my own experience to possess marked remedial value. For the purposes of this discussion, drugs may be classified into acids and alkalies, digestants, astringents, antiseptics, stimulants and sedatives, nerve-tonics, chalybeates, certain bland oils and drugs of the bismuth type which, in addition to their general systemic effects, produce mechanically, by their local sedative action, a remedial influence; and laxatives or purgatives.

The Administrations of Acids.—HCl is virtually the only acid which I have found it necessary to prescribe as an acid in real gastric or intestinal cases, though in nervous dyspepsia from neurasthenia dilute phosphoric acid is often an efficient substitute. Salicylic, carbolic, and hydrocyanic acids are also

occasionally useful, but none of these act as acids, being prescribed on account of other properties in them. Nitric and nitrohydrochloric acids are often given in gastric and hepatic cases and the latter I formerly employed largely myself, but we possess very much less definite knowledge of their effects, and I doubt whether either is so well suited to atonic gastric conditions as the dilute hydrochloric acid. Letting the latter, therefore, stand for the whole class of acids, when such a remedy is needed in the varieties of disease under discussion, I cannot do better than to reproduce here in full the following paper by myself, which was presented to the Section of Materia Medica and Therapeutics of the American Medical Association in June, 1898. The paper was as follows:

“The Place of Hydrochloric Acid in the Treatment of Diseases of the Stomach.—The time has come for a definite and precise statement of what hydrochloric acid can do in the treatment of stomach diseases—when and how it is useful, as well as when and how it can be harmful.

“Riegel in his recent work¹ very pertinently remarks: ‘While formerly HCl was prescribed in nearly all dyspeptic conditions, its employment has of late been essentially limited, since it has been recognized that it is by no means true, as was once assumed, that in almost every form of dyspepsia a lack of HCl exists.’ There is much other testimony to the effect that even among the aggravated stomach conditions for which the advice of a specialist is sought, an excess of this acid is very often found in the gastric juice. Could all cases of gastric derangement, including the earlier stages of catarrhal affections, be brought to the test of a chemical analysis of the stomach contents, it is probable that those with either a normal or excessive secretion would be largely in the majority. And none of these require the administration of HCl as a medicine. Indeed, it is capable of doing pronounced harm in all such cases. We should expect, *a priori*, that to introduce this active drug artificially into stomachs which already secrete it in too

¹ “Die Erkrankungen des Magens,” Vienna, 1896.

Large quantities, would intensify the depressing and painful symptoms of hyperchlorhydria. Experience has abundantly shown that this result usually follows in such cases when the drug is administered in considerable doses.

"The well-known antiseptic power of HCl might tempt one to give it in the numerous cases in which, despite the presence of a normal percentage of this acid in the gastric juice, the patients suffer from eructations of gas as a result of fermentation in the stomach, and (as still more frequently happens in cases with a normal or overabundant secretion of gastric juice) are plagued with a large amount of intestinal flatulency. Indeed, this remedy is administered every day by excellent physicians in these conditions, not after having actually learned, through a gastric analysis, that a full proportion of HCl is not secreted, but upon a venture, assuming that there may be a deficiency, and if not, that in any case the drug is antiseptic and must do some good. Just here is where the mistake is made.

Hydrochloric Acid is an Injurious Remedy in Certain Cases.—"To administer HCl in cases in which it is not deficient, is not only to do no possible good, but generally to do harm, and for these reasons: This drug, as has been pointed out by the writer in previous papers,¹ acts even in small doses as a decided stimulant to the gastric glands, and when long continued rarely fails to increase largely their activity, except in gastric atrophy or cancer. This property, which renders it so useful as a remedy when the gastric juice is insufficiently secreted, becomes a cause of injury in the opposite condition. Therefore, HCl taken into a stomach already fully supplied with it, and the stomach contents after meals being thus as acid as nature intended them to be, must not only produce at the time an excessive degree of acidity, with all the harmful

¹ Diet in the Chronic Catarrhs of the Gastro-Intestinal Tract, *Jour. Amer. Med. Assoc.*, February 19, 1898; and Important Indications and Contra-Indications for Massage of the Abdomen, *Inter. Med. Mag.*, January, 1898.

results especially to digestion in the small intestine which this implies, but, if administered often enough, may easily set up a more or less permanent hyperchlorhydria.

Hydrochloric Acid does not Prevent Fermentation.—" But it may be urged that we might risk some overacidifying of the gastric juice and the resulting impairment of intestinal digestion if by this means we can lessen fermentation in the stomach. Unfortunately, however, in the cases in which there is no deficiency of HCl, very little, if any, antiseptic action can be demonstrated as a result of its administration. In the acid gastritis described by various authors in Germany and France, and especially in recent treatises by Hemmeter ¹ and by Van Valzah and Nisbet ² in this country, a condition which my own experience has shown to be very common, and the one most often present when a normal or excessive proportion of HCl is found associated with much fermentation, the gas-forming bacteria seem to acquire a tolerance for the HCl and to thrive in spite of it. At all events, the fact that even a very great excess of HCl in the human stomach does not prevent fermentation has been made familiar to the writer by a large number of observations. Riegel has lately called attention to it without attempting to account for it. In his work already referred to he says:

"That the presence of free HCl in the stomach contents is no hindrance to the development of an abundant gaseous fermentation is a long since established clinical fact, which, through the researches of Kuhn and Strauss, has been given a further support. It has been proved that the HCl of the gastric juice under the existing conditions has absolutely not the disinfecting properties against the yeast fungi which have been established for it in a pure solution of the drug or in artificially prepared gastric juice, but, on the contrary, the view always maintained

¹ "Diseases of the Stomach," by Dr. John C. Hemmeter, Philadelphia, 1897.

² "Diseases of the Stomach," by Dr. W. W. Van Valzah and Dr. J. B. Nisbet, Philadelphia, 1898.

by us has been confirmed—that when stagnation exists the preferred soil for the gaseous fermentation is afforded by just those cases which show a normal or overlarge amount of HCl.’

“Some experiments recently reported to the Hospital Medical Society by Toinot and Brouardel, and published in the *British Medical Journal*, show that the bacillus coli can be made to acquire a tolerance for arsenious acid even in strong solutions. They succeeded in training this bacillus to grow well in bouillon containing three grams to the liter of arsenious acid.

“Then, why may it not be that bacteria in the stomach gradually become accustomed to the presence of HCl until finally even a large excess of it does not affect them? At all events the gas-forming micro-organisms are found to flourish in the stomach even when there is present a very large excess of HCl; and in these cases when they have become chronic, it is the rule to have grievous complaints of flatulency, both gastric and intestinal, with an endless train of nervous symptoms, including, especially, mental depression and insomnia, along with, usually, constipation.

Valuable Effects of Hydrochloric Acid.—“What has already been said as to the contra-indications for HCl tells, in a measure, where and how it can be helpful in the treatment of gastric affections. There are a few prominent gastro-enterologists who seem to place little reliance upon this drug in any case, but the writer has found it of exceeding value not only as a palliative in cases of atonic dyspepsia, but also as a reconstructive tonic in cases of chronic gastric catarrh, which have not yet progressed to entire atrophy of the glands. In fact, the results which have followed its administration in my practice (usually in combination with pepsin) fully warrant me in assigning to it in the therapeutics of all the stomach diseases characterized by hypopepsia (except cancer and atrophy) a place second only to diet and the mechanical treatments, including especially abdominal massage.

"My notebooks contain the histories of a large number of cases in which the administration of HCl for from one to four months, more or less continuously, has been followed by a most notable and apparently permanent increase in the secretion of the gastric glands. In the majority of my cases massage and the use of pulleys or other suitable exercise for the strengthening of the trunk muscles were also employed as a regular part of the treatment, and the results in these cannot, of course, be cited as proving the efficacy of any one of the curative measures relied upon. The cure of the patient having been naturally the first consideration, the treatment has not been limited to any one agency, no matter how valuable. A large amount of evidence has thus been accumulated which, it must be admitted, is inconclusive in so far as concerns the relative value of the various remedies used.

"But, fortunately for the purposes of this paper, some of my hypopeptic patients found it impracticable to have massage, and, at the same time, were unable, for various reasons, to carry out with any regularity the directions as to methodical exercise, and the marked gain in digestive power acquired by these must be credited mainly to the medicine taken.

"Wegele¹ and Hemmeter² among recent authors bear witness to the powers of HCl as a stomachic or stimulant to the peptic glands. Hemmeter also quotes Riegel, Reichmann, and Mintz as having reported cases of achylia gastrica in which the restoration of the secretion of HCl was effected by a more or less prolonged dosage with the same acid. Hemmeter gives twenty drops of the diluted HCl in appropriate cases in two ounces of water every half hour, beginning fifteen minutes before meals and continuing it till half an hour after the meal. He has frequently seen excellent results from this method, and believes that the motor function of the stomach is favorably influenced as well as the glands, a view which my own experi-

¹ "Therapie der Verdauungskrankheiten," von Dr. Carl Wegele, January, 1895.

² *Loc. cit.*

ence confirms. My practice has been to give much smaller doses. I direct the patient usually to begin with a dose of four or five drops of the dilute HCl given after each meal in this way: The amount prescribed, which is gradually increased if necessary up to ten, or exceptionally even to twenty drops, is added to half a goblet of water which the patient is directed to take in small sips at frequent intervals during an hour or an hour and a half. In cases of complete or nearly complete anacidity the sipping of the diluted acid is begun immediately after the meal, but in other cases not till the meal has been over for half an hour. In this way the amylaceous portions of the food are given time for the action of the saliva. I was led to adopt this gradual method of administering the acid through having observed a number of cases with absence of free HCl in which the patients complained of a marked burning in their stomachs after taking quite small doses of the remedy. This apparent intolerance of the drug was overcome entirely by having it taken gradually in small sips, and the results eventually were quite as gratifying as in other cases in which no such disagreement had occurred.

“ Except in those cases where, in spite of deficient or absent HCl secretion, there had been demonstrated a normal proportion of pepsin or of pepsinogen, I have usually combined with HCl a moderate amount of a good preparation of pepsin in the form of a glycerole. When, owing to the exigencies of a busy practice, the quantitative tests have included the total acidity and the amount of free HCl only, pepsin has generally been added to the mixture, and in a very large proportion of such cases the digestive power has decidedly increased, insomuch that the patients after a time were able to do without stomach remedies.

“ **Reports of Cases.**—In the cases, reports of which are given below, no very severe restrictions of the diet were imposed, though hot or fresh bread, fried articles, sugar, nuts, vinegar, the sourer fruits, especially uncooked, and shellfish, except oysters in their season, were excluded, and the patients were

enjoined to eat slowly, using their saliva to moisten all starch foods and to drink either nothing or very sparingly at meals.

“CASE I.—Lady, aged 36, resident in New York, while on a visit in Philadelphia, came under my care on account of chronic indigestion, with much fermentation, constipation, anæmia, irregular menses, impaired sleep, and cardiac palpitation. She gave a history of having suffered in a similar manner for several years, and of having had more or less trouble with her stomach for twelve years. Had formerly had much pain after meals, and for this had been directed to take, freely and continuously, tablets made up mostly of sodium bicarbonate, about five grains in each. She began by taking one every hour, or sixteen a day, but finally reduced them to eight daily. These were continued with little or no medical oversight for three years, until they markedly disagreed by causing nausea. External examination, when this patient came under my care in December, 1896, showed the right kidney to be loose and very movable and the stomach dilated, extending from the normal limit above to several inches below the level of the umbilicus, with tardy expulsion of the contents. The liver area was somewhat smaller than normal, but the other organs presented nothing abnormal.

“Analysis of the stomach contents after a test breakfast showed a total acidity of only 24 and an entire absence of free HCl. Rennet test, no result in twelve hours. Indican in excess in urine. My first prescription contained in each fluid dram *m x* of dilute HCl with *m xv* of glycerole of pepsin, *m 1¼* of Tr. Nuc. vom. and *m ½* of carbolic acid. A teaspoonful was added to half a glass of water and, beginning half an hour after meals, the patient sipped the entire solution during the hour following.

“Shortly after beginning treatment she was attacked with a severe diarrhea, which necessitated a different line of medication for a week or more. Then a new digestive mixture was given, with the dose of HCl reduced one-half, and the other ingredients, except pepsin, omitted.

“February 25, 1897, the patient came on from New York and reported improvement in nearly all ways. She had continued her last mixture. The stomach analysis now showed T. A. 40 and free HCl .0146. Less fermentation and better

sleep. No excess of indican in urine. The pepsin was now left out of the HCl mixture and a few drops of carbolic acid were again added to it. Massage of the abdomen was tried, but proved too exciting to the menstrual function, the first treatment having brought on the flow, out of time and in excess.

"Since the above date, the patient has seen me at long intervals only. October 7, 1897, she came on to Philadelphia and reported that she had continued the HCl mixture until six weeks previously and considered herself then practically well. She had gained twelve pounds in weight, presented a good color and clean tongue, and had lost most of her symptoms except the constipation.

"She afterward fell ill with grippe in New York, and came under the care of Dr. Lockwood of that city on account of this disease and its complications. She was confined to her bed or her room there a large part of the winter, but at the end of it all her physician wrote me, under date of March 28, 1898, that a gastric analysis showed total acidity 50; free HCl 22 (equal to .080) and combined HCl 22.

"She reported herself to me again April 4, 1898, and looked well, considering her recent long illness. There was improved gastric motility, but her stomach was still greatly enlarged, she having declined intragastric electricity and abdominal massage, the two surest remedies for that condition.

"CASE II.—Lady, aged 40, wife of a physician in a neighboring city, consulted me March 22, 1897, on account of paroxysmal attacks of indigestion, from which she had suffered for twenty-six years. They were characterized by violent eructations of gas and seemed to be caused by some unusual emotion or excitement. Formerly they occurred once in several months and were not followed by any specially unpleasant consequences, except nausea and some feeling of oppression. But within the last two years there have been three serious attacks of the kind, which were followed by colicky pains and jaundice, with pruritus, lasting a week. These attacks also followed some marked nervous shock or emotional excitement. One occurred just after her father's death. Between times she is said to have had usually fair digestion, with no pain or discomfort after meals and very little eructation. Her bowels have been fairly regular as a rule, but she is very constipated always at the time of the attacks. The latter, of

late, have sometimes recurred every day for several weeks, accompanied by severe colicky pains and vomiting. Ingesta, taken two or three days before, have occasionally been vomited. Color pale, and looks dejected. Physical examination: Lungs and heart normal. Liver enlarged. Stomach, slight displacement downward along with atonic dilatation; the upper boundary was one to one and a half inches too low, and the lower boundary between two and three inches below the level of the umbilicus. The kidneys not palpable. No tumor. Gastric analysis after test breakfast: T. A. 12; free HCl entirely wanting. Small amount of mucus. Diagnosis: Chronic catarrh of the stomach and duodenum. Prescribed: \mathcal{R} Tr. Nuc. vomic., $\text{f } 3 \text{ ij}$; Ac. hydrochlor. dil., q. s. ad $\text{f } 3 \text{ j}$; Sig. 10 to 15 drops in half a glass of water after meals. Diet to be as unfermentable as possible.

"Two months later patient reported improvement. No further attacks.

"August 6th of same year her husband reported that she had been obliged to continue the mixture regularly. Every attempt to omit it was followed by a return of indigestion. October 14th; patient recovered a few days ago from one of her severe attacks, which lasted two weeks, with eructations, pain, and constipation.

"Gastric analysis: T. A. 18; free HCl, none; mucus, very small amount. Prescribed: \mathcal{R} Ac. hydrochlor. dil., $\text{f } 3 \text{ vj}$; glycerol pepsin, q. s. ad $\text{f } 3 \text{ ij}$; Sig. Ten drops in half a glass of water, half an hour after meals, by sips. Every other week to take the following: \mathcal{R} Argent. nitrat., gr. x; Ext. taraxaci, 3 j ; M. et. ft. pil No. LX.; Sig. One after each meal.

"April 21, 1898. Has taken both medicines, as above ordered, the HCl mixture continuously and the silver half the time. She now has a good color and is very much stronger. No further attacks. Gastric analysis: T. A. 40; free HCl .041 (nearly normal); mucus, a small amount. The lower border of the stomach was found to be near the level of the umbilicus.

"CASE III.—Lady, a teacher, aged 23, referred by Dr. Samuel Bolton of Philadelphia, October 6, 1897. Her chief complaint was headaches and vomiting every few days with much nausea, and occasionally vomiting, especially evenings between the attacks. There was also stubborn constipation

and feeling of load in her stomach after meals. Organs generally found healthy except stomach, which was moderately dilated, extending down to half an inch below the umbilicus with delayed emptying. The gastric analysis showed only a very small amount of free HCl—.014, though the total acidity was 66, representing largely fermentation products. There was much mucus in the stomach. I advised lavage and the combination of HCl and pepsin as the main treatment. On account of marked starch indigestion, she also took Taka-dias-tase for a time, and Roncegno water was taken for some weeks to bring up the quality of the blood.

"On April 9, 1898, I found the stomach much retracted in size, the lower border being one and a half inches above the umbilicus, and the gastric analysis showed T. A. 56; free HCl .075 (that is a normal secretion); mucus a very small amount. She had had no severe headache with vomiting for three months and had regained a normal color, though her gastric catarrh is not yet entirely well.

"CASE IV.—Gentleman, aged 66, consulted me July 21, 1897, in Atlantic City, on account of chronic indigestion, from which he claimed to have suffered nearly all his life. Painful accumulations of gas and obstinate constipation were prominent features. The external physical examination revealed nothing abnormal. Gastric analysis: T. A. 16; free HCl wanting. Starch digestion good. Mucus very small amount. He was placed upon HCl and pepsin in the usual way. He has since seen me several times on account of his wife, but reported that he himself was doing so well on the digestive mixture as not to require any further medical assistance.

"December 16th, he was seen, and was then feeling well. On April 22, 1898, his wife called to consult me for herself and reported that her husband had been continuing his HCl and pepsin, though less regularly, having virtually recovered his health. He had taken no other medicine except a little nux vomica during the first few weeks, and a laxative at night. He had not had massage, except such kneading over the abdomen as he had been able to give himself.

"In this case no opportunity has been offered of testing the stomach contents again, but it is highly probable, from the decided improvement in the patient's digestion, as well as in his

general health, that the gastric glands are now doing much better work.

“ Reports of a number of other cases might be added, in which, under a treatment consisting either entirely or mainly of the administration of HCl and pepsin, conditions of apepsia or hypopepsia improved more or less markedly, the gastric secretion having returned to the normal. Without claiming that such fragments of clinical experience can be accepted as demonstrating beyond question that HCl stimulates the gastric glands, it must be admitted that a strong presumption is thus established as to the existence of such an action.”

Later Experience with HCl.—During the five years which have elapsed since the foregoing article was written, not only my own further observations in a large number of cases, but the clinical experience of most writers upon the subject have confirmed the views and results therein recorded.

Pawlow,¹ in some experiments on dogs, failed to obtain evidence that HCl has a directly stimulating effect upon the gastric secretion, but this failure by no means disproves the significance of the numerous positive findings above reported, and the results of recent carefully conducted experiments by myself.² HCl does not exert any sudden stimulant effect which could be demonstrable at once, but rather a gradual tonic influence which only after some days or weeks, and sometimes not until after months, makes itself manifest in the form of an increased secretion.

As to the methods of administering the dilute HCl, the paper above reproduced in full describes that which has proved most effective in my hands, and I quote also the following from a paper by myself, read by invitation before the Alabama State Medical Society, April 15, 1902, and entitled “ The Place of Drugs in the Treatment of Stomach Troubles.”³

¹ “ The Work of the Digestive Glands,” Philadelphia, 1902.

² The Place of Drugs in the Treatment of Stomach Troubles, *Int. Med. Mag.*, June, 1902.

³ *Loc. cit.*

“In the condition of deficient secretion of the gastric juice, especially of the HCl—such as obtains generally in old cases of chronic gastric catarrh of the atonic type, and even also in some cases of chronic nerve exhaustion of long standing—an entirely opposite line of treatment is necessary. In many of these cases nothing effects such prompt beneficial results as the administration of the officinal dilute HCl in doses of from 5 to 30 drops, combined usually with pepsin. Rarely have I found it advantageous to increase the dose beyond the latter amount, even when the deficiency in the secretion of HCl has been very great, notwithstanding the recommendations of some high foreign authorities in favor of colossal doses of the acid. These recommendations are based upon theoretic grounds, especially the fact that it would require several drams of the dilute HCl to meet the requirements of the stomach in the digestion of a large mixed meal. The truth is that the usefulness of the HCl as a remedy consists mainly in its stimulating action upon the secreting cells of the stomach, and probably not to any considerable extent upon its power of supplying the place of the absent or deficient gastric juice. This point I have fully considered in several previous communications, and will not enlarge upon here. Let it suffice that my own experience, which is amply supported by that of numerous other careful observers, proves beyond question that HCl does, in many cases, gradually bring up the secretion of the normal acid of the stomach to its proper level when deficient or even almost absent previously.

“Experience demonstrates also that very large doses, and even in fact moderate doses, sometimes markedly disagree with stomachs which careful tests show to be greatly in need of the remedy. A burning pain is often produced by it in such oversensitive stomachs, and it is necessary, therefore, in these cases, to administer it a little at a time. The appropriate dose should be added to a half tumbler of water and taken in sips every few minutes during the hour following each meal. I am accustomed to prescribe the remedy in this way in all cases where

such a prescription is indicated, and my patients frequently allude to it familiarly as 'the sips.' In these cases characterized by deficient secretion, benefit may also be obtained often from the administration of the bitter tonics, especially nuxvomica, quassia, columbo, etc., and Ewald, among other German writers, strongly recommends condurango bark for the same condition."

LECTURE XXXII

DIGESTANTS, ALKALIES, AND NATURAL SPRING WATERS

The Digestants.—Theoretically, pepsin or some other preparation capable of digesting proteids in the stomach with the aid of HCl—such as papoid, caroid, pineapple juice, etc.—and also for other classes of cases the rennet ferment, the various extracts of pancreas, etc., should be valuable helps in many cases of indigestion, but, as a matter of fact, it is probable that few, if any, remedies are frequently prescribed with such disappointing results. The chief reason for this is, doubtless, that they are not given to the right cases, or else not at the right times or in sufficient amounts. My own observations, confirmed by those of Einhorn and of other very busy internists, would indicate that in some places, if not in civilized countries generally, a majority of dyspeptics have too much HCl, and probably also of the ferments, in their gastric juice, and, therefore, need in the earlier stages of their malady, alkalies, bismuth, and sedatives, rather than digestants of any kind.

Again, though exceptionally, the gastric juice in certain cases does not contain sufficient pepsin, while HCl is yet present in normal amount; more frequently when one is deficient both are, and in such cases to order pepsin or any proteolytic ferment without including HCl in the prescription, is to accomplish no good result and possibly to do harm.

A series of experiments carried out in my laboratory in 1901 showed that in four out of six cases the addition of pepsin without HCl to samples of chyme in test tubes taken up during the height of digestion produced a slight retardation of the digestion of cubes of albumin placed in the tubes at the same

time. These four samples of chyme contained free HCl, though in somewhat deficient amount. There were numerous other experiments and they tended to prove that the administration of pepsin alone, even when HCl seems to be present in normal proportion, is ineffective, neither improving the digestive work at the time nor producing any such beneficial after effect as results from the administration of HCl.

It is likely, however, that there are occasional exceptional cases having along with a full supply of HCl a deficiency of pepsin, and that in such cases the administration of some proteolytic ferment like pepsin might prove efficacious.

The same series of experiments showed that while the administration of scale pepsin in 5-grain doses for periods of five to seventeen days did not effect any improvement in the work of the peptic glands, dilute HCl in 10-drop doses given three times a day for five to six days markedly increased the subsequent secretion of the same acid. Moreover, as an additional experiment, six specimens of chyme extracted from the same five subjects one hour after a test breakfast were subjected to the following tests:

“Small cubes of coagulated egg albumin of the same size were prepared and one of these introduced into each of four test tubes with 3 c. c. of the filtered stomach contents taken up one hour after an Ewald breakfast. Nothing further was put into tube 1; to tube 2 two grains of scale pepsin were added; to tube 3 one drop of dilute HCl, and to tube 4 both pepsin and HCl were added.”

The tubes were kept in an incubator at a temperature of approximately 38 C. Of the tubes to which HCl alone had been added four out of the six showed a more rapid digestion than in the control tube. In the same proportion of the tubes to which pepsin alone had been added there was a slower digestion than in the control—a positive retardation; but in all of the six tubes to which both HCl and pepsin had been added the process of solution was more rapid.

Confirmatory Clinical Evidence.—A limited number of such

experiments, no matter how carefully conducted, cannot be accepted as conclusive, but when they confirm abundant clinical experience the results should certainly have weight.

Having begun earlier in my practice as a somewhat routine plan the administration of HCl and pepsin combined in smaller doses of the former, too, than are commonly advised in cases of deficient secretion of the same, and having found that my cases almost uniformly improved under it, the percentage of HCl secreted gradually increasing, I have continued to follow such a method. Its value has been confirmed by my own experiments as well as the observations of other clinicians, notwithstanding the disbelief in the value of pepsin expressed by some authors. By itself the latter is doubtless generally valueless, but combined with HCl it is highly effective, wherever the tests show the latter to be deficient. The objectors urge that in most such instances pepsin or pepsinogen is present in the gastric juice. Doubtless; and it is still more certainly true that the rennet ferment is almost never absent from the gastric juice, except in atrophy, yet the Russian experimenters have demonstrated that in atonic dyspepsias generally no digestant or combination of them acts with the magical efficacy of the natural gastric juice taken from a living dog, which contains along with the HCl not only pepsin and rennin, but probably also other ferments or active elements which chemists have not yet been able to discover by their analyses.

Useless Pepsin Compounds.—But let me warn you to place no faith in the pharmaceutic monstrosities which are said to contain pepsin combined with pancreatin, with which it is positively incompatible, nor those in which it is combined with wines or any preparation of alcohol which, except in the weakest dilutions, interfere with its action. Nature understands better how to combine it so as to have its work done effectually.

Pancreatic Preparations.—Pancreatin not only cannot be combined in the same mixture with pepsin, since they mutually destroy each other, but it cannot be prescribed with any benefit

so long as pepsin and HCl are being secreted by the stomach, though in cases of deficient secretion of the latter it may often be used helpfully to peptonize artificially milk, porridges, etc., before these are ingested.

It may also render effective aid when administered with a small amount of soda to patients with gastric atrophy—when there is no longer any gastric juice. But while the various extracts of pancreas act best in an alkaline or feebly acid medium, you should bear in mind that much soda in these atrophic cases, according to recent experiments, is likely to diminish the secretion of the pancreas itself, which is normally promoted by the presence of some free HCl in the duodenum. This observed fact would lead one to infer that since, in gastric atrophy, dependence for digestion must be placed mainly upon the pancreatic juice, it should be best even in these cases to administer HCl (without pepsin), but clinical experience has shown this to be commonly ineffective under such conditions.

Alkalies in Gastro-intestinal Disease.—The alkalies form a most important class of remedies in certain diseases of the stomach and intestines. In deficient gastric secretion the mineral acids (HCl being the best of them) have proved themselves highly advantageous with real curative virtues; yet they can be dispensed with. One can get on without them and yet hope for fairly satisfactory results. If the patients do not progress so surely toward a favorable result, they at least do not suffer for want of them. In the gastric derangements, however, accompanied by a large excess of HCl with severe acute pain or other urgent symptoms consequent upon the excessive secretion, we have no effective medicinal substitute for full doses of some alkali and such a remedy is imperatively required. Some general suggestions as to the dosage and modes of administering alkalies in such cases were contained in the paper above cited and they are here reproduced.¹

“The administration of alkalies is generally necessary in

¹ The Place of Drugs in the Treatment of Stomach Troubles, *Int. Med. Mag.*, June, 1902.

excessive secretion of the HCl of the gastric juice, whether it be in the form of an excess of the same during the digestive periods only, as is most common, and known as hyperchlorhydria, or a persistent flow during all the twenty-four hours of every day, as in Reichmann's disease, or a paroxysmal flow with very large excess for a few days at a time, as in gastroxynsis. This treatment is necessary whether the HCl excess is a merely functional derangement, or is associated with either an acid gastric catarrh or with round ulcer of the stomach. The selection of the alkali in such cases is not a matter of indifference. When the bowels are not in need of a laxative, sodium bicarbonate in doses of from 15 to 60 grains, given two hours after each meal, and in the worst cases combined for a week or two at first, with small or moderate doses of either belladonna or atropin, will be usually most useful. Sometimes it is better to administer, at the same periods, a combination of sodium bicarbonate 15 grains, bismuth subnitrate or subcarbonate 15 grains, and calcined magnesia 10 to 20 grains, according to the condition of the intestines, the dose of the magnesia being adjusted so as not to allow constipation to result from the bismuth. In many such cases magnesia, having a far greater alkalinity, acts better than soda, since large doses of soda are required when the latter is given alone.

"In the constipated cases a similar combination, with a sufficient increase of the magnesia to insure regular evacuations, usually suits well, and the belladonna here affords valuable assistance in bringing about a freer opening of the bowels. The HCl excess often depends upon reflex irritation from a movable kidney, and then drugs will do little good till the latter can be held in its normal place. When the hyperchlorhydria has already developed into gastric ulcer, the opportunity is afforded for some of the most brilliant results obtainable in the therapeutics of any chronic disease." But the special method of treating gastric ulcer is fully discussed in a separate lecture under that head.

The alkaline mineral waters deserve special mention here.

They include particularly the Vichy, Selters, Carlsbad and other spring waters of Europe as well as the Saratoga Vichy, Saratoga Kissingen, and Bedford Spring waters of this country. Perhaps mention ought to be made also in this connection of numerous very slightly alkaline waters, such as those from the Poland Spring in Maine, and those from several springs in the vicinity of Waukesha, Wisconsin, besides the many much advertised lithia waters, the latter of which when natural, however, contain as a rule only the minutest quantities of lithia. Few of these contain a sufficient proportion of any alkali to exert a noteworthy antacid action, but many of them seem to produce a beneficial influence upon nutrition quite out of proportion to their mineral contents. A large part of this is doubtless due to the diuretic action of the water itself, which the patients would not drink so freely if it were not supposed to possess some medicinal properties; but I am inclined to believe that the minute amounts of silica and other saline ingredients, even in the very small proportions present, increase the efficiency of the water.

Natural spring waters as a rule do often effect results which cannot be obtained by the administration of equivalent doses of their principal mineral constituents in artificial solutions, and when patients are able to bear the increased expense of such medication you may sometimes find it preferable to prescribe the French Vichy waters instead of sodium bicarbonate, or Bedford water when you desire a slight laxative action in addition to an antacid one. There are many other American alkaline spring waters which no doubt possess valuable remedial properties, but sufficient experience with them has not yet been accumulated to warrant dependence upon them. The Saratoga Vichy water is said to answer well in hyperchlorhydria, but it happens that my experience has been greater with the imported Vichy, and in urgent cases I have preferred full doses of soda or magnesia or a combination of these with bismuth, as directed in my lecture on that affection.

The Effect of Alkalies before and after Meals.—Upon one

point concerning which there seem to be very divergent opinions held by authors, I desire to advise you strongly and emphatically: it is as to the effect of alkalies and the alkaline waters upon gastric secretion. Certain writers have asserted that an alkali given before eating always increases the secretion of HCl, and given after meals lessens it. This is not true. This piece of misinformation has been handed down from the time of Sidney Ringer at least, and from how much more remote a period I do not know. The facts are that a relatively small dose of any alkali, or alkaline waters in which the alkaline element predominates over the saline constituents, will tend to stimulate secretion whether taken before or after meals, (though doubtless rather more certainly when taken upon an empty stomach), and that in a relatively large dose it will tend to lessen secretion. I have repeatedly confirmed this in practice, and often to my great regret as well as to the sorrow of some of my worst hyperchlorhydric patients, when, in trying to restrain the very excessive excretion of HCl, I prescribed too small a dose of some alkali, as, *e. g.*, 15 to 20 grains of sodium bicarbonate to be taken an hour or two after eating, since the result was an aggravation of the trouble. How small the dose must be to stimulate and how large to depress, depend upon the susceptibility of each patient's gastric glands.

The Saline or Chloride Waters.—There is a marked difference in the effects of those natural spring waters which contain predominantly the alkaline carbonates combined generally with some of the sulphates of sodium, etc., as in the Carlsbad waters, and on the other hand such waters as those of Homburg and Kissingen which contain chiefly the chlorides. The former in the usual doses lessen hyperchlorhydria, and depurate generally, being, therefore, particularly well suited to plethoric persons who regularly overeat and under-exercise. The chloride waters, on the contrary, in the case of patients with deficient HCl usually stimulate the appetite and gastric secretion and tend to correct catarrhal tendencies in the gastro-intestinal tract without weakening or depressing. The

persons—mostly neurasthenics—who are benefited by these saline chloride of sodium waters, would be nearly always injured by a course at Carlsbad, and in some instances at least the converse is true. Some day, it is to be hoped, our numerous American spring waters will have been sufficiently studied, so that we may obtain from them a like variety of effects and prescribe them in the same way to meet definite indications.

Since the foregoing was put in type, I have had the pleasure of going over the MS. of Professor von Noorden's monograph concerning the "Effects of Saline Waters on Metabolism" (which at the time of this writing is going through the press of Messrs. E. B. Treat & Co., of New York), and find that a series of very carefully conducted experiments and clinical observations, carried out by himself and his assistants, somewhat modifies the views hitherto generally held in regard to the action of these spring waters.

He has satisfactorily established, I think, that as used in the ordinary dosage in connection with an appropriate diet, both the Homburg and Kissingen waters may influence favorably, not only most cases of chronic gastric catarrh associated with hypochlorhydria, but also a certain proportion of cases of acid gastric catarrh, and perhaps also, some cases of hyperchlorhydria dependent upon reflex or other causes. The good effects in the latter class of derangements are doubtless due in large part to the influence of such waters in overcoming constipation, and relieving the catarrhal condition in both stomach and intestines, thereby improving the nutrition generally.

I quote here the exact language used by von Noorden in his summing up regarding the effects of the waters in question¹:

"In numerous cases of gastric disorder, particularly in gastric catarrh, the use of saline mineral waters leads to an ac-

¹ "Concerning the Effects of Saline Waters (Kissingen, Homburg) on Metabolism," by Prof. Carl von Noorden (Frankfort) and Dr. Carl Dapper Bad Kissingen). E. B. Treat & Co., New York, 1904.

tive and permanent increase in the production of hydrochloric acid.

“In numerous cases of gastric disorder accompanied by hyperacidity (particularly in nervous dyspepsia) the moderate use of saline mineral waters leads to a decrease in the hydrochloric acid production, and a decrease of the subjective symptoms.”

LECTURE XXXIII

TONICS, STIMULANTS, AND SEDATIVES

The Nerve Tonics.—In true cases of gastro-intestinal neurasthenia—nervous dyspepsia—good results can often be obtained from the giving of nerve tonics in suitable doses, provided no one drug, and still less a combination of them, be administered long enough to overstimulate. The most useful drugs for this purpose I have found to include the hypophosphites, the glycerophosphates, iron, arsenic, gold, silver, quinine, the valerianates, and small doses of the bromides combined with some roborant remedy. The bromide of sodium in doses of 5 to 10 grains, after meals, in a mixture with tincture of the chloride of iron well diluted and pleasantly flavored, will often prove effective, when not permitted to constipate. In no class of cases, however, does the experience and personal skill of the physician count for so much as in the manifold complications of neurasthenia and anæmia with more or less well-defined disease of the gastro-intestinal tract or vague derangements of digestion and nutrition. Inexperienced physicians usually make the mistake of prescribing too much medicine—especially too many and too strong nerve tonics in these as in other troublesome cases. Your safest rule will be to give the nerve tonics—which, with the exception of iron, act chiefly as “spurs to a tired horse” in most cases—as cautiously and sparingly as possible, beginning with small doses increased as necessary, and not to continue with any one of them—except iron for anæmic patients—very long, rarely over two to four weeks, and only so long if it has agreed perfectly well.

Belladonna and hyoscyamus or their alkaloids are useful sometimes in hyperchlorhydria and in bowel obstruction, but

They are remedies for emergencies and their prolonged use can do much mischief.

Alcohol Rarely Necessary.—As to alcoholic stimulants on the one hand and the more powerful sedatives or narcotics on the other, with increasing experience I find myself prescribing both classes of remedies less and less. When patients are tired or exhausted, the manifest indication is for rest rather than for a stimulant of any kind, unless there is a persistent lack of energy in some organ when the appropriate tonic drug (provided no hygienic or mechanical measure will effect the object) would seem generally more suitable than the very temporary stimulation of alcohol, followed speedily by its inevitable reaction with then increased debility.

HCl, *e. g.*, is the best stimulant for the gastric glands; electricity, massage, or other mechanical excitant for the gastric or intestinal musculature (though these are powerful stimulants of secretion also), with strychnine or some medicinal purgative as a less desirable substitute; the Nauheim baths and exercises are the best cure for a weakened heart muscle with various more or less unsatisfactory heart tonics as substitutes, which are superior at least to alcoholic stimulants because their effects are longer lasting, even though at the best not very long.

The bromides are of real value because they steady an unstable nervous system, and in small doses, not exceeding 5 to 10 grains, two or three times a day for short periods, act as tonics rather than as depressants, though, when long administered, they lower the strength both mental and physical as well as most of the bodily functions.

The Relief of Pain and Insomnia Produced by Disease of the Stomach or Bowels.—Opiates and other narcotic remedies are exceptionally required to quiet pain which cannot be otherwise controlled, though I do not now prescribe them once where twenty years ago I would probably have found them necessary fifty times. Alkalies or an unloading of the bowels will relieve most pains in the stomach or bowels, with the help

sometimes of a hot wet pack or an active counter-irritant locally.

Hypnotics are, I trust, less abused than they were when sulphonal first came into vogue and, like all such remedies upon their original introduction, was hailed as a boon to insomniacs—an agent which was said to soothe mildly and harmlessly, without the possibility of danger. I have seen at least one patient made insane by sulphonal and two or three die from the prolonged use of it and trional, so that I am less easily convinced now that any such remedies are desirable unless for desperate emergencies. When your dyspeptic patients do not sleep, in the absence of brain disease or of any clearly recognizable painful condition, it will usually be because of a seriously lowered nerve tone which calls for building-up, not lowering, agents, such as all the hypnotics and narcotics are in full sedative doses; but perhaps the most frequent exciting cause of wakefulness will be found to be indigestion with accumulations of gas in the stomach or bowels. The surest remedy in these last cases will be that which will stop the fermentation, if at the same time measures are carried out designed to fortify the strength and raise the nerve tone of the patient.

Iron and its Principal Preparations.—It is probable that iron is not sufficiently often given in the affections of the stomach and intestines. The fact that its astringent preparations frequently increase constipation and, at least in full doses and when not properly combined, may disturb the digestion, has led to a distrust and neglect of this grand remedy in a class of cases for which at times it is able to do very much. Chronic indigestion in most of its forms goes hand in hand with anæmia. A vicious circle is soon formed; the indigestion produces a lowered nutrition with impoverished blood and these in turn increase the indigestion. Iron in many cases can speedily break such a chain of sequences and supply the additional energy which is necessary to restore the digestive power. Even the fermentation can often be restrained by 5 to 10 drops of the good old-fashioned tincture of the chloride of iron taken

after meals and guarded, as previously suggested in speaking of nerve tonics, by the same number of grains of sodium **b**romide freely diluted, especially if there be added to the **t**reatment either HCl or an alkali, accordingly as the gastric **s**ecretion is deficient or excessive. Such a combination is at **o**nce tonic, nervine, and antiseptic, and I have found it to effect **m**uch good in anæmic, debilitated dyspeptics when the stomach **w**as not irritable. In these cases constipation nearly always **e**xists anyway, and if you follow the methods of cure I shall **l**ay down for you in a subsequent lecture, this symptom will **u**sually respond to your treatment satisfactorily in due time, in **s**pite of the iron—sometimes all the sooner because of the im-
proved digestive power and increased nerve and muscle tone **w**hich iron gives.

For many cases, however, blander preparations, such as the **r**educed iron, the carbonate, the pyrophosphate or especially **B**laud's pills are better borne and effect the desired result more **c**ertainly because of the combination with an alkali which per-
mits the giving of very large doses safely. Another most **e**fficient preparation for anæmic nervous patients with deficient gastric secretion is the modern substitute for the old Parrish's Chemical Food—Syr. ferri phosphatis—though it contains proportionately a good deal less iron than the others, along with much dilute phosphoric acid.

The expensive preparations with which the market is just now flooded are no better; most of them are not so good as those above named. The so-called organic iron compounds are less efficient and only slightly, if at all better borne than the blander official preparations, so that there is rarely an excuse for resorting to them. However, Pepto-Mangan has been very largely employed with good results, and this as well as Ovofer-
rin and other similar organic compounds of iron may be tried in cases in which the stronger iron salts disagree.

The Ferruginous Mineral Waters.—Ever since learning personally from Professor Ewald, in 1895, that it was a remarkably effective remedy, I have prescribed largely the Ron-

cegno Water, which seems to be little known in this country, and have almost uniformly been pleased with the results. It comes from the South Tyrol, and is so strong both in iron and arsenic that a tablespoonful of it with a glass of any pure water makes a fairly full dose, while one to two teaspoonfuls after each meal (always with plenty of water) prove sufficient for many cases. Small doses of these two metals usually agree best with dyspeptics, and any considerable dose of this strong water might disagree in decided inflammatory conditions or in cases having any tendency to vomiting or diarrhea. Ewald often prescribes also the Levico iron and arsenic water from another spring in the South Tyrol, especially for the gastric neuroses.

There are many other famous springs of iron water, including, especially in Europe, those of Franzenbad and Elster, which are practically recommended by Boas because in their waters the iron is combined with large amounts of alkaline and saline ingredients, and he considers iron by itself, not thus combined, to be badly borne in well-marked dyspeptic cases. It is certainly true that iron preparations are always likely to agree best in even cases of nervous dyspepsia, and still more so in serious gastric or intestinal disorders, when combined with one or more alkalies and salines, especially mild laxatives largely diluted, as occurs in many popular iron waters.

The list of the mineral springs in the United States containing iron in notable quantities is a very long one, but unfortunately most of them are yet undeveloped, their virtues known to a few only, and their valuable medicinal waters scarcely obtainable anywhere away from the localities of the springs themselves. The springs at Saratoga and Ballston Spa, New York, are alkaline, saline, and laxative, with a small content of iron, while the Putnam Spring of Saratoga has over 7 grains of iron to the gallon. The water from the Londonderry Litha Springs of New Hampshire contains 1.85 grains of iron carbonate and 7.29 grains of lithia carbonate to the gallon along with about the same proportion of carbonate of magnesium, and also a

very much larger proportion of lime salts, which are less desirable for many cases.

The "Round" Spring at Aurora Springs, Missouri, contains about 7 grains of iron to the gallon, and among other iron springs of some note are the Bath Alum and Rock Enon Springs, Virginia; the Topeka Mineral Wells, Kansas; Brown's Wells, Mississippi; and the Adirondack Mineral Spring and Oak Orchard Acid Spring, New York. At Hammonton, New Jersey, half-way between Philadelphia and Atlantic City, there is a spring the water of which contains 13.63 grains of iron to the gallon, a much larger proportion than any of those above named (so far as their analyses are known) except the very strong arsenic iron waters of the South Tyrol.

The Bismuth Preparations, and Cerium Oxalate.—The salts of bismuth are of prime importance in the treatment of many digestive disorders, and in the same class may well be placed the oxalate of cerium, which is equally insoluble and has a very similar sedative action upon the mucous membranes. The latter drug, however, while it seems to exert less antiseptic and astringent action than the bismuth salts, goes beyond these in influencing apparently the pneumogastric center either directly or reflexly, insomuch that it often helps to control reflex nausea as well as coughs.

The bismuth preparations are nearly identical in their action, except that, as previously explained, the subcarbonate is somewhat more alkaline, and the salicylate rather more antiseptic. I have never been able to observe any superior virtues of any kind in the subgallate, and indeed, whether prescribing for astringent, antiseptic, or local sedative effects, have usually found the subnitrate about as good as any other of the salts.

The possibilities of bismuth for good are often not fully realized, because it is given upon a full stomach instead of an empty one and in far too small doses. As a sedative and astringent in gastric ulcer, for instance, doses of 20 to 60 grains are required. In such doses on an empty stomach it proves exceedingly effective.

The Bland Oils.—Olive oil and cottonseed oil (and probably also linseed oil, though I have had less experience with this internally) seem to exert no real dynamic action, but for that very reason are most valuable as mechanical remedies—cures—in constipation. Probably the most highly refined petroleum oils may be equally free from medicinal influence, but cosmoline, vaselin, and albolene, all of which I have made full trials of, do in time depress weak hearts a little. They act even better than the bland vegetable oils in overcoming constipation, when taken by the mouth, since they make no call whatever upon the digestive juices, no attempt seeming to be made by the latter to act upon them, and no disorder of the digestion results—rather, on the contrary, an improvement of it in consequence, doubtless, of their help in keeping the lower bowels unloaded. Dr. A. L. Benedict has discovered a firm which is said to purify the coal oil so thoroughly that no toxic product remains in the oil. The latter is called Purpetrol. My experience with this preparation has not been large, but it has proved efficient in a number of cases. It exerts very little, if any, depressing effect on the heart.

In my experience during the past year, the cotton-seed oil injected into the bowel at bedtime in doses of 2 to 6 ounces, and allowed to remain till morning, has succeeded in a large minority, if not a majority, of all patients suffering from chronic constipation, in curing the disease when the patients would persevere with it and follow out at the same time a proper regimen, including gymnastic exercises, a suitable laxative diet, and in the worst cases a course of massage and electricity.

The effect of all these bland oils seems to be to soften the feces and lubricate the mucous membrane; and, besides, they act locally as sedatives, soothing an irritated mucous membrane.

LECTURE XXXIV

ANTISEPTICS, ASTRINGENTS, AND LAXATIVES—MINUTE DOSES OF CERTAIN DRUGS

ANTISEPTIC remedies are usually disappointing. They sometimes seem efficient in the milder cases of fermentation or putrefaction—cases in which a more careful diet with more exercise and attention to the bowels are nearly always sufficient of themselves to cure; but when there is serious and persistent gas formation, as in catarrhal affections and in cases with decidedly weakened motor power of the stomach or intestines, antiseptics as well as other remedies fail until the cause can be removed. Stomach washing, laxatives, or colon douches—measures which rapidly remove the fermenting remains of food or feces from the weak-walled viscera—are, in such cases, often the only really effective palliatives even, while appropriate mechanical modes of treatment are nearly always required to cure.

Carbolic acid, which is often given and helps somewhat to restrain moderate fermentation in the stomach, is only safe or permissible when the gastric secretion is low, since it rapidly stimulates it, often aggravating or causing hyperchlorhydria even when ingested per rectum. The sulphocarbolates are inefficient except in the largest doses, and then probably act as carbolic acid upon the glands. The salicylates restrain fermentation to some extent; but, like the former remedies, only more so, weaken the heart if long administered. Bismuth in full doses is mildly antiseptic, but constipates.

Probably the safest antiseptics, when otherwise indicated, are nitrate of silver and tincture of the chloride of iron, since

both are tonics; the former exerts a good effect in doses of one-twelfth to one-quarter grain in catarrhal cases (combined with bismuth subnitrate), especially in chronic acid gastritis; and the latter, in 5- to 10-drop doses, well diluted, combined frequently with 5-grain doses of sodium bromide three times a day, agrees better in atonic cases accompanied by excessive fermentation. The iron I have seen markedly and quickly improve the motor function of some stomachs.

Resorcin, thymol, menthol, spirits of chloroform, and numerous other drugs credited with antiseptic powers, may prove useful auxiliaries to more curative treatment for short periods, but none of them can be safely continued long, and all of them will be likely to fail you at times in cases in which they seem most needed. Sodium benzoate, and ammonium benzoate act efficiently in some mild cases, and salol has decided antiseptic power; but these have the same limitations and objections as the drugs previously mentioned.

Astringents are not abused as much as laxatives, merely because diarrhea is not as frequent as constipation, but a wrong use of them is responsible for much suffering and numerous deaths, especially in children. I recall with sorrow the ill success that I had in treating such cases in my earlier years of practice while a zealous believer in the efficacy of combinations of astringents with opium. These combinations are often temporarily effective, but the flux generally returns in aggravated form after being checked for a time with any of the stronger astringents, even in spite of a persistence with them in the largest allowable doses; this is almost invariably so in chronic forms of diarrhea, and especially so in dysentery.

Bismuth, which possesses only feeble astringent powers, is the most useful of the entire class in catarrhal affections of the alimentary canal, and this chiefly because of its locally emollient and absorptive virtues as well as probably its slight antiseptic influence. I have not found much difference in action between the various salts of bismuth, though the subcarbonate,

being the most alkaline, probably has some advantages in hyperchlorhydria, and the salicylate is somewhat more antiseptic than its other salts.

Laxatives and purgatives constitute a very important class of remedies, though perhaps none are more frequently abused. The need of regular and complete alvine evacuations is imperative; no case of indigestion can be even improved when this function is imperfectly performed, but, on the other hand, one might add with truth that the digestion is never really sound so long as laxatives have to be regularly administered to secure bowel movements.

Laxatives and purgatives, then, are very necessary for emergencies, sometimes helpful in overcoming obstruction, and useful almost as a routine measure in the beginning of the treatment for diarrhea, but harmful usually when depended upon as a prolonged means of treatment in chronic constipation; yet, in the more intractable forms of the trouble, when a cure is out of the question, a judicious alternation of some of the milder laxatives may be necessary as a choice of evils—safer, usually, than a constant dependence upon enemas of water or any aqueous solutions.

If, however, we may be allowed to include among laxatives such bland vegetable oils as olive, cottonseed, and linseed oil, the two former of which in particular scarcely possess any real medicinal properties, it cannot be said that all remedies of this class are useless as a means of curing constipation, though most of them certainly are. When given by enema in doses of two to six ounces at bedtime, together with a suitable diet and sufficient exercise, they do not often fail to cure, acting mechanically as solvents of the feces and lubricants of the intestinal mucous membrane.

In catarrhal dysentery the saline laxatives constitute the best form of treatment—full aperient doses at first and smaller doses at three- or four-hour intervals later. Castor oil and calomel in moderate purgative doses are still the best remedies to clear out the alimentary canal in beginning the treatment of

diarrhea; very small doses of the same, from one-hundredth to one-tenth of the purgative dose, are often the most efficient means of treating the same disease later, after a complete emptying of the bowels. Similar minute doses of podophyllin are also very effective, especially in painless watery forms of diarrhea either in afebrile conditions or in typhoid fever. The following case, previously reported by me,¹ shows in a striking way what very small doses of podophyllin and again similar doses of Fowler's solution of arsenic can occasionally do in desperate forms of diarrhea, after opium and astringents have failed:

“Early in August, 1886, before the underground sewerage had been generally introduced into the hotels of Atlantic City, a girl of thirteen developed a violent attack of typhoid fever. Before the end of the first week the child lay in a stupor, with bowels moving involuntarily a dozen or more times a day. Dr. Julius Kaemmerer, lately of Philadelphia, a physician of great experience and ability, was associated with me in the case. The outlook for the child having become very bad, a distinguished consultant was called from Philadelphia. The usual astringents, bismuth, opium, and even lead, were given persistently without effect. Another consultant from the same city, a gentleman of the highest eminence and of world-wide reputation, was now sent for to see the girl. Other astringents were tried in the hope of checking the exceedingly profuse diarrhea, which was fast exhausting her, but all to no avail. Our consultants made but one visit each, returning afterward to Philadelphia, and so had little opportunity to display their undoubted skill and fertility of resource. The case was now desperate in the extreme, and we had scarcely a hope that death could be averted. At this juncture the writer recalled some fortunate experiences with comparatively small doses of podophyllin in severe diarrhea. It was remembered that podophyllin specially affects the small intestine, the part in which the most characteristic pathologic changes are found in enteric fever, and since Dr. Anstie's experiments, quoted by Professor Ringer, showed that the

¹ The Primary and Secondary Action of Drugs, *London Practitioner*, April and May, 1888.

Drug in large doses caused intense congestion and even ulceration of the small intestines, it was believed that a suitable dose should exert an opposite or restorative action upon the same part. Dr. Kaemmerer, though not acquainted with such a use of the drug, willingly consented to the trial, since we had pretty well exhausted all the usual measures, and, indeed, the patient's stomach had become irritable, so that she could retain but little of anything. Then, stopping all other medicines, we administered 1-120th of a grain of podophyllin with a little sugar every third hour. After the third dose a marked improvement set in. The discharge from the bowels was rapidly checked, until within twenty-four hours the stools almost entirely ceased, and my colleague even expressed the apprehension that the medicine might prove too astringent.

"The effect upon the temperature, which had been ranging between 103° and 104° to 104.5° F., was quite extraordinary. Quinine had been used at an earlier stage with little effect, and fairly full doses of antipyrin produced absolutely no favorable impression, though we had neither of us seen it fail before. But coincidently with the correction of the diarrhea after beginning podophyllin, there was a marked decline in the temperature, amounting at first to about two degrees in twenty-four hours. The subsequent treatment was mainly of a supporting character with occasional remedies for a pulmonary complication, which at times gave trouble, and the improvement, with the exception of such complication, thenceforth went on steadily till the temperature reached the normal.

"After the temperature had remained normal for a week, there occurred on the 15th of September a relapse, the temperature rising on the 16th to 105.4° , higher than at any time before. There were again frequent involuntary stools, with yet more profound adynamia, as well as delirium and stupor. Podophyllin was again tried in the same doses, and now failed. We then resorted to Fowler's solution in doses of one-eighth of a drop every two hours. Since arsenic, in full doses, produces a violent choleraic condition, probably by paralysis of the vaso-motor nerve supplying the stomach and intestinal tract, it was reasoned that small doses should exert an opposite, *i. e.*, a tonic or restorative action upon the same tract. The effect was as prompt and satisfactory as had been that of the podophyllin in the former attack. The bowels were speedily checked, the temperature rapidly fell, touching the normal

again by September 23. Thenceforward convalescence was uninterrupted, very little other medicine being given."

I could instance numerous other cases in my experience in which one-hundredth of grain doses of podophyllin proved promptly efficient in controlling similar severe forms of diarrhea, both acute and chronic.

The Usefulness of Certain Drugs in Minute Doses—Cuprum Arsenite.—It was John Wesley, I think, who objected to letting the devil have all the good tunes, and whatever wickedness may still be imputed to the homeopaths, I never could see the wisdom of letting them monopolize any really efficient remedies. In this connection it is worthy of note that it was in my practice in Atlantic City some fifteen or sixteen years ago that minute doses of arsenite of copper were first given a systematic trial by any physician of the regular school. I related my experience with it in colic and diarrhea to Dr. John Aulsebrook of Philadelphia, and in consequence of his enthusiastic published reports concerning its efficacy, it rapidly attained such popularity that for many years past most of the manufacturing pharmacists have included it in their lists of tablet triturates. It has since been so greatly abused by administering it in cases for which it was unsuitable, and in too large doses, that its popularity has of late been waning; but it remains true that in doses of one-thousandth to one-five hundredth of a grain repeated every fifteen to thirty minutes, arsenite of copper will often control severe intestinal colics dependent upon spasmodic contractions of the circular muscular fibers of the intestines, whether the accompanying condition be one of spastic constipation or colicky diarrhea. But it will not cure appendicitis or peritonitis, nor will it remove any obstruction of the intestines not dependent upon spasm, and it is useless and dangerous usually to push its administration beyond a few hours, at the most, since it ordinarily proves effective in that time if it ever will, and even such small doses can produce toxic effects if continued long.

If any of you should be interested in the *modus operandi* of medicines in such minute doses, you will find the subject fully discussed in my London *Practitioner* paper above cited. I therein explained it in strict accordance with the scientific law that overstimulation always produces secondary depression, and that in the case of certain drugs, including most of the purgatives especially, we have been accustomed to avail ourselves only or chiefly of the large-dose, secondary, and often toxic, action, while the homeopaths limit themselves exclusively (whenever they adhere closely to their principles) to the opposite primary small-dose action, which is always stimulant to the nerve centers or other parts affected, though if this chance to be an inhibitory nerve, the result of its stimulation must be a lessening of function in the structure supplied by it. Thus the action is really antipathic, not homeopathic at all, since nearly all disease signifies weakness and depression in the diseased structure itself, in its regulating center, or in the nerves or vessels supplying it.

But we of the regular school also habitually administer many remedies for their primary small-dose effect only, avoiding strictly the large doses which would produce their physiologic or toxic action. Among such remedies may be mentioned arsenic, most of the metallic salts, hydrocyanic acid, alcohol, and ether and chloroform internally. Other drugs we administer in both small and large doses for totally different and often opposite effects. These include tartar emetic and ipecac, which in quite small doses act as expectorants, and the latter at least, as an anti-emetic, with no depression, while in large doses they produce vomiting and depression—when pushed, marked prostration. Calomel is largely used by pediatricists in small doses to control diarrhea in children, and the bichloride has been lauded as a tonic blood-maker in certain cases, while the purgative, depressing, and tissue-destroying influence of mercury, in its larger range of dosage, is well known. Certain other drugs, such as the drastic cathartics, the vermifuges, and the astringents, we regularly administer

for one of their secondary or physiologic effects only. It would seem that our therapeutics might gain much if the materia medica were to be studied anew, and a clear statement made regarding each drug as to its powers in each of its ranges of dose. The bugaboo, homeopathy, ought no longer to stand in the way of progress in this direction.

PART IV
THE GASTRO-INTESTINAL
CLINIC

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LECTURE XXXV

INTRODUCTORY—THE CLASSIFICATION OF DISEASES

IN Part I, have been rehearsed briefly certain elementary and basic facts, anatomic, physiologic, etc., which should assist you somewhat in the study of our subject. In Part II, have been discussed the various methods of examining patients in whom there is reason to suspect the existence of disease of the stomach or intestines. And in Part III you have had presented to you rather full descriptions of the methods in general by means of which such disease can be best remedied. Now we come to the still more important part of our task, the consideration individually of the diseases in question.

At the threshold of this study arises the question of classification—nosology. Various plans have been followed by others. Most authors have admitted the desirability of basing their classifications so far as possible upon anatomic and pathologic grounds, but all have been obliged to admit also that many clinical pictures must be recognized and treated as distinct entities for which no well-defined pathologic basis yet exists. They differ, however, widely in their methods of drawing the lines. Several eminent authors, for example, refuse to consider as a distinct disease such a conspicuous anatomic and pathologic condition as gastric dilatation, and insist upon considering it under a term having reference to the atony or insufficiency of the gastric muscles upon which it usually depends. Then, nervous dyspepsia and the gastric neuroses generally are terms restricted by some to a comparatively few obscure affections not otherwise explicable, while others expand them widely, including under them all the derangements of secretion as well as the

motor and sensory disturbances. I shall try to take a middle and conservative ground in this respect. Without disputing that both excessive and deficient secretion of HCl are often attributable merely to nervous causes, I shall describe these very frequent and important affections to you under titles that do not imply any special theory as to causation. They constitute symptom groups calling for special forms of treatment additional to, and very different from, that required for the original nervous or other affections to which they are secondary; and, moreover, they may result also from inflammations of the gastric mucous membrane as well as from other causes, including, according to my own observations, besides those of other writers, movable kidney—perhaps also the displacements of other abdominal organs—gall-stones, renal calculi, etc. There are abundant reasons, then, for considering these affections under separate names.

I am inclined to agree rather with Leube than with some of the more recent writers in limiting the term *Nervous Dyspepsia* to those gastric or intestinal derangements of apparent nervous origin for which no anatomic or pathologic basis has yet been discovered. For example, whether or not hyperchlorhydria can cause gastric ulcer and proliferative gastritis, these latter affections are now believed to be capable of producing hyperchlorhydria, so that not all cases of the latter at least can be properly classed as neuroses. In like manner, certain obscure gastric pains which are now usually called neurotic, or at least neuralgic—gastralgic—are likely to result really from perigastric adhesions or other undetermined, but none the less actual, anatomic lesions. The truth is that the nervous system is intimately involved with every derangement of the health in whatsoever part or organ it shows itself, regardless of whether such part or organ is itself structurally diseased or not; but the opinion is growing that the difference between what are called functional diseases and those known to be organic is less than was formerly supposed.

It is difficult to conceive of the possibility of any consider-

able or prolonged disturbance of function that does not involve at least a slight change of structure, however transient in duration. And the longer such a so-called functional disease lasts, the greater is likely to be the structural change accompanying it. For example, whenever on account of the reflex irritation from a movable kidney, an overtaxed brain, or merely over-eating, the gastric glands are stimulated into excessive secretion and we have the familiar picture of hyperchlorhydria set up, it is inconceivable that the glands remain the same as under normal conditions. They are necessarily swollen, congested, and the blood supply to them is unduly increased. This hyperæmia might properly enough be spoken of as functional when it is transient and the glands return within a few hours or even days to the normal again; but when it persists for weeks or months, pathologists find that certain structural changes have taken place in the cells, changes which are not necessarily permanent or irremediable, but none the less pathologic in character. If by functional diseases were meant those which are usually curable and temporary, and by organic diseases those which are incurable and, therefore, permanent, there would be more reason for such a classification; but no such significance can now be attached to these terms, since it has been well established that resolution can occur in inflamed tissues and that degenerated cells sometimes undergo regeneration. In other words, organic diseases are sometimes curable; and, on the other hand, certain affections which have been generally classed among the functional disorders are comparatively seldom completely cured.

There does not seem, thus, to be any good reason for retaining longer the time-honored division of diseases into functional and organic. It is confusing, misleading, and serves no good purpose. A better classification for the so-called functional disorders would be under the title, Diseases Having No Known Anatomic Basis.

Then, in placing certain gastro-intestinal derangements under the head of neuroses, as must be done for the present,

we should clearly explain that by such a classification we merely express our ignorance of their actual causes or of the lesions upon which they really depend, though some of them are known to be manifestation of actual disease in the nervous system. I agree in the main with Riegel who, in this connection, says:¹

"Are we justified in separating all functional disorders of the stomach, all forms of dyspepsia, into those diseases that are based on some tangible anatomic lesions of the organ and those that are purely functional in character? Is it correct to designate the latter class as neuroses? I believe that a division of this character goes altogether too far; however desirable it may be to have an anatomic basis for every disturbance of function, we cannot say that we possess such a basis for the present in a large number of functional diseases of the stomach; at the same time it does not appear to me that we are justified in designating the latter class of disturbances neuroses, because we have not so far discovered the lesions of the stomach that cause them.

"We are hardly justified in calling a disease a nervous disorder because pathologic-anatomic changes are absent, or, better, because we cannot find them; more is needed, we should be able to demonstrate and to prove that these functional disorders are really caused by hyperstimulation or inhibition."

Riegel, it will be observed, while still finding it convenient to designate as functional the lighter or more obscure affections for which we cannot demonstrate an anatomic cause or lesion, plainly considers that some such lesion exists even though we cannot find it. I would, therefore, paraphrase one of the sentences quoted above from Riegel to read thus: "We are hardly justified in calling a disease a functional disorder because pathologic-anatomic changes are absent, or better, because we cannot find them."

But, while there probably are no diseases which involve ex-

¹ "Diseases of the Stomach," by Franz Riegel, Philadelphia, etc., W. B. Saunders & Co., 1903, p. 291.

clusively functions and not at all the organs by which the functions are performed—that is none that may properly be called functional disease only—there are doubtless many affections of the gastro-intestinal tract which may with strict propriety be called nervous, because they are either symptoms of disease in the nerve centers or elsewhere in the nervous system or or else they are reflected from morbid conditions in some other part and only show themselves in the regions mentioned because of the heightened reflexes which a diseased nervous system produces. This is especially likely to occur in hysteria or neurasthenia.

Another difficulty in arriving at a satisfactory classification of the diseases under consideration is the fact that inherited or acquired weakness of the nervous system is constantly observed as a complication of the familiar diseases of undoubted organic character such as ulcer, cancer, etc. In consequence we rarely encounter a clinical picture that is not more or less complicated with nervous features. An inherited neurasthenic tendency predisposes to displacements and constipation, while these help to develop nervous trouble or increase an already existing neurasthenia and thus things tend to go on from bad to worse in a vicious circle. Again certain persons have been endowed from birth with a neurotic tendency to overeat and to eat too fast for adequate mastication. Naturally they easily fall victims to one or more of a whole series of affections such as hyperchlorhydria, acid gastric catarrh, ulcer, constipation, diarrhea, dilatation or displacement of the stomach, etc., some of which are usually classed among the neuroses, some among functional disorders, and others among the organic diseases, and yet types of each class may often coexist in such a case. Frequently it is the nervous complications of the diseases causing real tissue changes which determine the symptoms. I have seen a number of cases in which a pronounced chronic gastritis has existed for years without producing any discomfort, because there did not happen to be any nervous complications, and the patients, but for a persistently furred

tongue, or some eruption on the skin, considered themselves well.

All that can be done, then, is to designate with appropriate names the principal groups of symptoms or pathologic conditions and describe these to you as clearly as possible, cautioning you at the same time that you must not expect often to find them simple and uncomplicated, but most frequently inextricably mingled with symptoms of a weakened or otherwise diseased nervous system and at times with morbid states in other parts. Furthermore you should bear in mind that while some of the diseases which, for want of fuller knowledge, are classed among the neuroses, are really nervous affections, others are either reflexes from diseases elsewhere in the body or dependent upon lesions not discoverable, or at least not yet discovered.

Diseases of the Stomach and Intestines not always Separable.—In another respect I have found it convenient to depart from the conventional rule of authors to consider the diseases of the stomach exclusively in one part of their works, and diseases of the intestines exclusively in another—often in a separate volume. Nature has not separated the affections of these different segments of the alimentary tube by any such marked differences as to render this necessary, and it has seemed to me more natural and logical to discuss ulcer of the duodenum in the lecture directly following that in which ulcer of the stomach is considered, since the peptic ulcer constitutes practically the same disease whether it occurs in the stomach or in the duodenum. Then, having taken up the consideration of the subject of ulceration, it is more convenient and natural to continue with the same subject and proceed with the discussion of other ulcers of the intestines in the succeeding lectures, than it would be to postpone this to a later part of the book. Then, again, it has been more convenient to consider together in one lecture the subject of syphilis of the stomach and intestines and in another separate one the subject of tuberculous ulcerations of the stomach and intestines, in a book covering so much

ground within so small a space as this one essays to do. I regret that it has not been practicable also, without doing violence otherwise to the most natural sequence of the chapters, to consider the catarrhal inflammations of the duodenum and small intestine generally directly after the discussion of such inflammations of the stomach, since they are closely allied and Catarrh of the stomach probably rarely exists without the co-existence of a similar process in the duodenum.

LECTURE XXXVI

GASTRIC ATONY, OR MYASTHENIA GASTRICA (MOTOR INSUFFICIENCY, MECHANICAL INSUFFICIENCY)

UNDER the head of Gastric Atony I shall describe to you that condition in which the muscular layers of the stomach walls have become abnormally weakened and unable on this account to empty the viscus within the usual time. Many names have been suggested for the condition, some of which seem to me quite inappropriate, and the multiplication of names for it still goes on with much resulting confusion for students of the subject. Names for pathologic conditions or groups of symptoms which are frequently met with, even though devoid of a known pathologic basis, first of all should designate the condition as accurately as possible and, with this requirement fulfilled, the simpler and more familiar the term the better. The old term gastric atony or atony of the stomach expressed a very definite idea, that of a flabby weakened condition of the motor apparatus of the stomach, which prevented its being emptied as quickly as normally it should be. It is closely allied to the conception of gastric dilatation or gastrectasis because in both the stomach walls are weak and flabby, with usually a marked splashing sound to be elicited at almost any time during the day. The chief difference between these two conditions is the fact that in simple atony the stomach is merely weak but not enlarged, whereas in dilatation it is weak and enlarged both. But there is an entirely different condition in which the stomach is unable to empty itself within the normal time for the reason that there exists an obstruction at its outlet. There is in these cases often for a long time no weakness

Of any kind in the stomach, but, on the contrary, at first just the opposite as a rule, the muscular walls developing an exceptional degree of thickness and strength in the effort to overcome the obstruction. The only things in common between these two opposite conditions are the circumstances that in both the stomach is abnormally long in emptying itself and the hypertrophy which usually results primarily from a persistent obstruction of the pylorus eventually passes over into atony and then finally into an overstretching of the stomach walls. Both gastric atony from nervous or other constitutional cause and pyloric obstruction thus tend at last to develop into dilatation—gastrectasis. Several recent authors, including Boas, Riegel, and others, insist that these two opposite conditions of gastric weakness and excessive gastric strength should be considered together under a single name and hence the suggestion of various new terms such as Muscular Insufficiency, Mechanical Insufficiency, etc., having regard to the inability of the stomach in both to get rid of its contents in the usual time.

It seems to me, however, simpler, less confusing, and better every way to adhere to the old name Gastric Atony for the very definite condition of motor weakness in the stomach, and designate the condition of excessive strength of the stomach walls developed in the effort of the viscus to overcome an obstruction, by a different name which should be based upon its ætiology and pathology. Thus, if we call the latter condition Pyloric Obstruction, we have a name which does not need to be explained or defended and at the same time one which accurately defines it. The chief symptoms of Gastric Atony and of Pyloric Obstruction in its earlier stage before the thick wall weakens or dilatation occurs, are not the same, but very unlike, and the methods of treatment must be different. Why then confuse by our nomenclature such different entities?

Relative Importance of Atony, Dilatation, etc.—By giving Gastric Atony and the allied conditions, Gastric Dilatation and the displacements of the abdominal organs, the first place in

those of these lectures which are devoted to the consideration of the diagnosis and treatment of the various diseases of the stomach and intestines, I desire to impress upon you particularly their great relative importance. Too often physicians fancy that the main thing in regard to a doubtful stomach is to ascertain how much HCl it secretes, which cannot be surely determined without the introduction of a tube, and certain chemical processes which involve some sort of a laboratory and chemical training, while the results, though very important in many cases, are much less so as a rule than the determination of the motor power of the stomach, which it has already been shown, in Lecture VI., can be done in nearly all cases within a few minutes by an external examination, without having to introduce any kind of instrument into the stomach.

Many patients continue to enjoy fair health in spite of having a moderate excess of HCl constantly secreted and others, with a marked deficiency, or even a total lack of the same, often manage to get on without serious indisposition so long as they live very carefully; but the person whose stomach cannot get rid of a hearty dinner within seven hours, by passing it on into the duodenum, is always more or less of an invalid, and when his stomach does not habitually empty itself within each twenty-four hours, he is a sick man who urgently requires help, either medical or surgical, if he is to be prevented from more or less rapidly succumbing to his malady, and this quite regardless of whether his stomach secretes an excess or a deficiency of gastric juice.

Various Degrees of Atony.—There may be various degrees of gastric atony, and it is not necessary to limit the term arbitrarily to the state of weakness which prevents the viscus from emptying itself within seven hours after a dinner, as Leube and others do. The constant inability to accomplish this implies a decided grade of atony—a sufficient impairment of the motor power to injure the health quite materially, though less, of course, than that degree of atony which shows regularly

some remains of food in the stomach in the morning before breakfast has been taken. Indeed, whenever there is regularly experienced a feeling of weight or heaviness in the stomach after a full meal, and a splashing sound is obtainable at almost any time during the day by tapping over the stomach, you will be safe in diagnosing some degree of muscular atony, though these in any given case may possibly be symptoms of the graver condition of dilatation into which the atony has already developed. In the latter case, however, enlargement, as well as weakness of the stomach, can be made out by a suitable examination.

Ætiology.—Atony of the stomach is one of the most frequent results of our modern high-pressure mode of living. All the prevalent faults of hygiene, such as immoderate eating, excesses *in vino* and in venery, overwork, especially mental overwork, deficient sleep, and a lack of pure air and of exercise out of doors, predispose to this condition. Whatever tends to cause neurasthenia will be equally efficient in producing gastric atony, which, indeed, is a very frequent accompaniment of neurasthenia. Typhoid or malarial fever and tuberculosis markedly favor its development, as do also the severer cases of gastric catarrh, even in the asthenic form. Sthenic, or acid gastric catarrh, as well as a severe hyperchlorhydria, often causes spasm of the pylorus, with a resulting obstruction of the outlet, which, as in the case of cancer or other tumor in the pylorus or duodenum, or a mechanical obstruction of any kind in the same region, after a primary strengthening or hypertrophy of the stomach walls, in nearly all such cases finally superinduces a very marked degree of gastric atony and dilatation, but it is probable that in most of these cases there is first an enlargement of the stomach, due to muscular overaction, and that then atony and dilatation both result secondarily. This subject will be considered when I take up dilatation of the stomach.

In women the corset, by putting the abdomen in splints and preventing any efficient exercise of the abdominal muscles,

powerfully conduces to gastric atony. This mode of dress produces a most flabby and atonic condition of the abdominal muscles, thus lessening markedly the external supports of all the abdominal viscera. Sagging of many of these (splanchnoptosis) naturally follows, and is further favored by the constriction of the tight corset and waistbands above as well as by the weight of the many heavy skirts worn, especially in cold weather. The latter are supported only by the prominence over the belly, which the corsets and waistbands have helped to form by forcing the viscera downward and forward. This protuberance, therefore, is made up generally of the displaced stomach and intestines, including, in some cases, one or both kidneys as well. The displaced stomach is nearly always an atonic one, probably as a result of its disturbed innervation, and, indeed, the same forces just described often directly dilate it by dragging down the greater curvature, while the other parts of it remain fixed. Both atony, with its sequel dilatation, and also displacement of the stomach, are often inherited from one or both parents.

Symptomatology.—The symptoms of gastric atony are those usually attributed to dyspepsia. Indeed, when dyspepsia is not the result of an increased or lessened gastric secretion, or of catarrh, ulcer, or cancer of the stomach, it very generally means impaired motility or gastric atony—or the more serious condition of dilatation. Symptoms in these cases may be wholly wanting, but there may be a furred tongue, bad breath, belching of much gas (or possibly flatulence in the bowels), weight or heaviness after meals, though rarely a real pain, constipation, headache, disturbed sleep. Sometimes, though as a rule only after the development of dilatation and stagnation of the food, and also after the intestines have become secondarily involved by a catarrhal process, there may be more severe phenomena, such as anæmia, nervous and mental depression, complete loss of appetite, much physical prostration, emaciation, etc. Generally, however, so long as the disease is limited to a moderate atony of the stomach, the patient, though

complaining much, will eat and sleep fairly well, continue to attend to usual duties, and present the appearance of good, if not robust, health.

Diagnosis.—In Lecture VI., under the general head of Methods of Examination, I have described a convenient method of deciding whether gastric atony be present or not, as well as the degree of it. It is a more satisfactory one than any other that does not require the introduction of a tube. The same subject was gone over again in an article entitled Atony, Dilatation, and Displacements of the Stomach, which I contributed to the *International Medical Annual* for 1900. The following extract from that article will make clear several of the more practicable methods of diagnosing gastric atony:

“ Simple Tests of Gastric Motility.—If the patient be made to uncover the abdomen and assume the supine position with the legs slightly flexed, a few taps with the tips of the fingers over the stomach will generally reveal a marked muscular atony, when present, by the splashing sound which is produced. Sometimes, in consequence of extreme tension of the abdominal muscles, this splashing sound cannot be obtained even when the stomach contains much fluid and its walls are quite weak. In such a case, if, while the examiner presses his fingers against the lower part of the stomach, the patient be induced to contract voluntarily and repeatedly his diaphragm and abdominal muscles, as is done by the Oriental muscle dancers, the splash can usually be produced, or at least any fluid present can be felt, when there is much motor insufficiency.

“ In the perfectly normal stomach with properly strong and resilient muscles and not prolapsed, the splash cannot be evoked by any method, even directly after drinking. The louder the splash, the larger the area over which it can be developed, and the longer after a meal, or after drinking a definite quantity of fluid, it can be recognized, the greater the motor insufficiency. When it can be heard over a much larger area than the stomach normally covers, the atony has become a dilata-

tion; when heard lower than normal, there may be only a downward displacement.

"The writer of this has lately described a more accurate practical method by which any physician reasonably well skilled in percussion can first determine the boundaries of the stomach by percussion over it when empty, and again after drinking one or two glasses of water with the patient in different positions, especially recumbent and standing; and then, having ascertained the size and position of the viscus, he may easily determine its relative muscular power or motility by the time required to empty itself after test meals. Examinations of the abdomen by both the splash and percussion in the two different positions, and by the method above mentioned, will readily show when the stomach has become empty by the disappearance of the splash previously obtained, and of the zone of dullness heard over the lowest part of the stomach on percussion with the patient standing. In determining the boundaries, the results are more positive if the stomach be first inflated, either by pumping air in through a tube or by having the patient take a small teaspoonful of sodium bicarbonate dissolved in a glass of water, followed by 30 drops of dilute HCl in half a glass of water.

"In the case of patients accustomed to the tube, it is easier, for the physician at least, to introduce that instrument at different periods after meals, and thus learn how long it takes the stomach to propel its contents into the duodenum. This is Leube's method of testing the motor function."

Ewald's salol test was formerly much used to determine the motility of stomachs, but has been less depended upon of late, because with it there are possible sources of error; yet it will usually yield approximately correct results. It is described in Lecture VI.

Treatment.—To cure simple atony of the stomach it is necessary, first of all, to remove the cause. If the patient has eaten or drunk immoderately, he must stop and follow rational dietetic rules. Faulty modes of dress must be abandoned. Any

other palpable transgressions of the laws of health must then be corrected. If a condition of general neurasthenia exist, there must be a resort to the usual methods of overcoming it by rest in a degree suitable to the needs of the case, regulated exercise and nutritious feeding, with massage and electricity generally as well as locally to the region of the stomach. Direct faradization of the stomach with the intragastric electrode, as described in the lecture on the Treatment of Chronic Sthenic Gastritis (Lecture L.), will be the most rapid and efficient means usually of restoring tone to the weakened gastric muscle. Abdominal massage is next in efficacy, except when hyperchlorhydria complicates. When there is any excess of HCl in the gastric juice, massage of the abdomen needs to be avoided, and the condition must be vigorously combated by administering alkalies and belladonna in full and frequent doses at first, with smaller ones or less frequent ones later to maintain the effect; and in such a case, which does not yield soon to medicines, the high-tension faradic current should be administered intragastrically for five to eight minutes every other day. To neglect hyperchlorhydria is not only to risk the development of gastric ulcer and other serious complications, but also spasm of the pylorus, with a resulting dilatation of the stomach. Fuller details of the treatment applicable both to the severer cases of gastric atony and to dilatation resulting from either atony or hyperacidity, are given in Lecture XXXIX.

LECTURE XXXVII

DILATATION OF THE STOMACH—(DILATATIO VENTRICULI, GASTRECTASIS)

SEVERAL distinguished authors decline to give a place in their nomenclature for this very common and well-defined anatomic disease. They do not deny that there are such diseases as dilatation of the heart, dilatation of the esophagus, dilatation of the intestines, and probably dilatation of most of the other hollow organs, but when the stomach is affected in the same way, they prefer to disregard the anatomic condition and classify the malady according to one of its causes, such as obstruction of the pylorus or weakness of the stomach walls (myasthenia gastrica, motor or mechanical insufficiency), or according to its most important symptom, stagnation—isochymia. I freely concede that there is some force in their contentions, but nearly every innovator in this respect has coined a new name for the affection, and the result, besides being contrary to the analogy of similar lesions elsewhere, is complicating and confusing. Dilatation of the stomach is easily understood as that condition in which the viscus is both weaker in expulsive power, and larger than the average normal stomach, with a tendency to grow worse in both respects. The accuracy of this definition is in no way lessened by the fact that robust persons who eat or drink excessively may acquire stomachs of extra-large capacity, going on to enormous size in some instances, without at first showing any impairment of their motor power or other functions. Such enlarged stomachs during their stage of hypertrophy have been described by Ewald as cases of megastria, and by Boas as megalogastria. As such persons are usually not long-lived, it is quite possible

that most of them may die before the stage of dilatation develops.

Acute Gastrectasis.—By the term gastrectasis, or dilatation of the stomach, is usually signified a chronic or persistent form, which is rarely fatal except by gradually undermining the health and vigor after months or years. Recently, however, many cases of what are called usually acute dilatation of the stomach have been reported. Little or nothing is to be found in most text-books and treatises upon the stomach concerning this form of disease. Yet it is doubtless much more frequent than has been supposed, and as most of the cases so far reported have proved fatal, it is important to bestow some attention upon the subject in this connection.

Until very recently, the diagnosis was rarely made before death, it having remained for the autopsy to demonstrate the cause. A variety of hypotheses has been put forward to account for the sudden supervention of such a dangerous condition. It has occurred most frequently as either a sequel of operations upon the stomach or other viscera, or as a complication of pneumonia, or of one of the acute infectious fevers. Some writers have supposed that the gastric muscles had become suddenly paralyzed, others that there was a spasm of the pylorus as a result of hyperacidity. It is noteworthy that numerous cases carefully studied by stomach specialists, including two by Friedenwald of Baltimore,¹ had an enormous secretion of hyperacid fluid. Still others hold that there must have been a mechanical obstruction of some kind either at the pylorus, or, which seems more plausible, since the duodenum is often found to have shared in the dilatation, at some point in the intestines below.

It is very probable that each of these causes may be occasionally efficient in producing a sudden and dangerous dilatation, especially under the conditions named above, when the vital powers have been seriously weakened by infectious disease or the shock of an operation; also that in dyspeptic or debilitated

¹ *Am. Med.*, August 10, 1901.

persons overloading the stomach might cause it. Those of you who have followed this series of lectures attentively should not have much difficulty in making promptly the diagnosis of acute dilatation of the stomach, especially after the further consideration of the subject of gastric dilatation in general, given in this and the subsequent lectures. The same rules apply concerning both the diagnosis and treatment of the acute form as in the case of the chronic form, except that the symptoms, especially the prostration and later the vomiting, are more urgent, the pain, distention, and tympany usually much greater than in any chronic case, however marked or severe, and the necessity for frequent and thorough evacuation of the dilated viscus by lavage, more imperative. An early recognition of the condition, and energetic treatment of it in such a manner, would probably have saved a majority of the fatal cases hitherto reported, though, in those in which the infection and prostration were extreme, it is possible enough that even our more efficient modern methods of combating such accidents might have failed.

It seems scarcely necessary to remind you not to permit food, drink, or medicines to be taken by the mouth in acute dilatation. Least of all should soups or other excitants to the gastric glands be ingested in these cases, since there is likely to be in them a hypersecretion of the gastric juice, amounting sometimes, as in Friedenwald's cases, to a gastrosuccorhea.

CHRONIC DILATATION OF THE STOMACH.

The Ætiology.—Since these lectures are designed to be practical lessons on, rather than exhaustive expositions of, the subjects discussed, I shall teach you, regardless of the endless variety of classifications and definitions found in the books, that ætiologically there are two main kinds of chronic dilatation of the stomach—(1) the atonic, and (2) the obstructive. The latter may be subdivided again into (*a*) those in which the obstruction is spasmodic, which probably include a large majority, and (*b*) those in which it is mechanical. The mechanical obstruc-

tion may result from any of the following conditions, which are named as nearly as possible in the order of their frequency: (1) Round peptic ulcer, or the cicatrix of one, in the pylorus or duodenum; (2) the stenosing form of chronic gastritis, involving especially the pylorus; (3) cancer of the pylorus or duodenum; (4) kinks, or sharp flexures, in the pyloric end of the stomach or in the duodenum, produced by a displacement of the stomach, or by adhesions gluing the pylorus or duodenum to adjacent structures; (5) very rarely other tumors or a displaced right kidney occluding the outlet of the stomach, or lessening the lumen of the pylorus or of the gut below by pressure from without.

The strictly atonic dilatations, in which neither hyperacidity with spasmodic closure of the pylorus, nor mechanical obstruction plays any part in the ætiology, are probably less both in frequency and in extent, as a rule, than those depending upon obstruction, though you will see numerous cases in women in whom the corset and dragging skirts have had much to do with the causation as described in the preceding lecture on Gastric Atony. I have found dilatations dependent upon an excessive secretion of HCl (hyperchlorhydria and acid gastric catarrh), exceedingly common, and in a few cases the dilatation has seemed to result from an excessive organic acidity due to fermentation.

It is possible that a certain proportion of the cases in which the findings are dilatation of the stomach with absence of free HCl, stagnation of the contents, much organic acidity from fermentation, and no mechanical obstruction discoverable, may have been due to excessive eating and drinking, which first produced a hypertrophy of the organ, followed later by a weakening of the muscular fibers and dilatation. Other powerfully predisposing causes of atonic stomach walls, and thus indirectly of dilatation, are tuberculosis, cancer, gastropotosis, and diseases of the heart, catarrh of the stomach, especially in the acid form, and intestinal catarrh, disease of the liver, anæmia, or any vice of nutrition which lowers the nerve and muscle

tone generally. You should not forget that inheritance also plays an important rôle in the tendency to gastrectasis. The children of parents thus afflicted do not often escape it, according to my experience.

Symptomatology.—The symptoms differ much in the various types. In the mildest atonic form in which there are motor insufficiency and overdistention after eating, with little enlargement demonstrable when the organ is empty, the only symptoms may be a coated tongue, bad taste in the mouth, a feeling of weight in the epigastrium, and an uncomfortable fullness after meals, with usually considerable flatulence (especially shown by belching), a lessened appetite (though exceptionally the appetite continues good), and often constipation, headache, poor sleep, and some vague impairment of the general health. When the cardiac orifice contracts more tightly than the pyloric there may be no belching, but only a gradual accumulation of gas in the bowels. In such cases both the stomach and bowels are markedly distended and tympanitic for many hours after each meal. The bowels in such a case are often uncomfortably distended till after the next stool.

In the hyperacid form of dilatation there may be spasm of the pylorus only, with the cardia not tightly closed, when there will be active contractions of the stomach, accompanied usually by pain, which is relieved by belching of gas or by copious vomiting. When in this form of dilatation both orifices of the stomach remain long spasmodically closed, the violent and ineffectual contractions produce severe crampy pains, which are often not relieved until a large dose of some alkali or a decided sedative has been given or until emesis has been produced. The same conditions cause rapid exhaustion and overstretching of the muscular coats of the stomach, resulting finally, when not relieved, in considerable dilatation with sometimes stagnation.

In marked dilatation, fermentation is always excessive, the intestines are secondarily irritated and often infected. Constipation may then become obstinate, with all its in-

jurious consequences, but may alternate with diarrhea and anæmia, and the other symptoms of auto-intoxication, including mental and nervous depression, headache, insomnia, weakness, emaciation, etc., are likely to develop. The same cause, pyloric spasm due to hyperchlorhydria or acid gastric catarrh, may in time produce what is called dilatation with retention, a term applied to those cases, usually severe, in which remains of food are found in the stomach in the morning before breakfast, that is, ten to twelve hours after the last meal. You may occasionally encounter such a retention, even in cases of rather moderate dilatation, especially when the patient has eaten a heartier or more complicated meal than usual, or eaten the last meal of the day when exceptionally tired or worried. When the stage of retention has been reached, the vomiting becomes characteristic, occurring every two or three days, and bringing up often several pints of very sour and most offensive fermenting masses of partly digested food. Emaciation and a variable degree of physical weakness usually show themselves by this time, and go on from bad to worse in cases not under proper treatment, but in these hyperacid cases a vigorous and persistent treatment of the underlying condition may arrest the process at almost any stage, and start the patient on a long and toilsome road, which will finally lead, if persevered in, to a restoration of health.

When dilatation has resulted from any mechanical obstruction of the stomach outlet, except the swallowing of a foreign body, there are not likely to result such violent spasmodic pains as may follow the sudden closure of both orifices from the irritation of hyperacid gastric contents. The stenosis of the pylorus may develop more gradually, and thus the element of spasm be absent from the clinical picture. In other respects the symptoms, except when the obstruction is caused by a malignant growth, are much the same, and develop as in the form already described, though the course is usually more steadily downward and not amenable to non-surgical treatment, as it is in the hyperacid cases.

In the malignant cases, there is the added constitutional infection which hastens the downward course and begets its own peculiar cachexia, usually some time before the dilatation has progressed far enough to produce a serious auto-intoxication from the stagnation and retention.

In all the severer forms of dilatation which are accompanied by great delay in emptying the stomach, and especially by copious vomiting, the system is insufficiently supplied with fluid, and, in consequence, there is scanty urine, with thirst and a dry skin. You should always bear in mind in doubtful afebrile cases, accompanied by pronounced scantiness of the urine, that you may be dealing with dilatation of the stomach, and proceed to make a very careful examination of the abdomen.

Among the objective symptoms, or physical signs of gastric dilatation, are the splashing sound which is nearly always to be obtained in such cases by a light tapping with the fingers over the stomach, or by succussion, not only during the usual digestive period of two or three hours after a light meal, such as the continental breakfast, or six to seven hours after the usual mixed meal, such as a dinner, but even for a much longer period after eating. In a marked case of dilatation you can usually obtain the splash at any time after breakfast during the entire day and evening, though, unless there is retention, no such signs of fluid remaining in the stomach should be discoverable before any food or drink has been taken in the morning. When there is only slight dilatation of the stomach with strong or spasmodically contracted abdominal muscles, the splash may be elicited only by causing the patient to make sudden voluntary contractions of the diaphragm and recti muscles. The signs of dilatation, as well as of displacements of the stomach, which are afforded by percussion in various positions of the body and auscultatory percussion and auscultatory friction, were fully described and discussed in Lecture V. Some further account of them was also given in Lecture XXXVI., on Gastric Atony.

By the administration of a teaspoonful of sodium bicar-

bonate well dissolved in water, followed by 30 to 40 drops of dilute HCl, or a large half-teaspoonful of tartaric acid dissolved in half a glass of water, you will be able to inflate thoroughly any except the very largest dilated stomach, and with these it is safe to repeat the above doses within a few minutes. Having thus produced a marked tympany over the entire stomach, no great delicacy in percussion is required to map out the boundaries, except in very obese persons, and these are pretty sure not to have seriously dilated stomachs, though the latter are often simply enlarged—hypertrophied. To clinch the matter you should always note carefully the area limits of tympany on percussion, with the patient recumbent. Then, give two glasses of water and percuss the patient while in the standing position. If a zone of positive dullness or flatness now appears across the middle or even lower abdomen where before there was tympany, and you can elicit a splash there where there was none before, the lower line of the dullness marks the lower border of the stomach, especially if the lowest limits of the splash coincide. If the colon should be full and the result, therefore, seem in doubt, empty it by a copious enema, or by physic, and test in the same way again.

Some of the chemical tests of gastric motility, such as Ewald's salol test, described in Lecture VI., or Klemperer's oil test, may be employed to confirm the results of percussion, but are not very certain, and not necessary. Reliable means of deciding in very doubtful cases as to the position of the boundaries are the instrumental methods, such as palpating with one hand over the bared abdomen, the tip of a sound introduced into the stomach; or, better yet, palpating in the same way Turck's revolving sound—the gyromele. By means of the latter, especially, one with a little practice can easily and very certainly outline the stomach. There remain the examination of the organ by means of the Roentgen rays—practicable with the aid of an unusually powerful apparatus only—after causing the patient to swallow half an ounce of bismuth in emulsion, on each of several days in succession, and the use of the electric

lamp within the stomach, which is feasible enough when further confirmation of the simpler methods is necessary.

COMPLICATIONS AND CONSEQUENCES OF GASTRIC DILATATION

It would be a well-nigh endless task to enumerate all the possible complications and consequences of gastrectasis, especially if one were to include in the list all the consequences of the diseased conditions upon which dilatation of the stomach may depend. Hyperchlorhydria, in any of its forms, including acid gastritis, pyloric ulcer, pyloric cancer, and other obstructive disease of the pylorus, as well as diabetes and various acute infective diseases which can cause gastrectasis, all tend to produce at the same time other derangements of the health, and all of these that occur might be considered in a sense complications of the dilatation.

Among the most serious of the complications which can result from a neglected gastrectasis, through the fermentation and putrefaction of the long-retained gastric contents, is tetany, a brief account of which will be found below.

Autotoxic nephritis, a weakening of the entire muscular system, including the heart, insomnia, neurasthenia, and nervous prostration are other possible complications or consequences of the autotoxæmia which may be superinduced by a prolonged and incurable or badly treated curable form of dilatation of the stomach.

Tetany.—In many and various forms of gastro-intestinal disease associated with neurasthenia and anæmia, you will find a hyperexcitability of the reflexes. In a good many of them the patients will complain of being awakened out of sleep by involuntary twitchings or contractions of the extremities—especially the legs. Very exceptionally, indeed, in extreme dilatation of the stomach with hyperchlorhydria or stenosis of the pylorus, there occurs what is called *tetany*. This affection is characterized by convulsive attacks in which there are spasmodic contractions of the flexor muscles of the arms and

legs, especially the calves. The abdominal and other muscles may also be involved, and there is often during the attack a peculiar fixed grimace due to a spasm of the facial muscles. Generally, consciousness is not lost, but there is frequently some disturbance of the speech, and occasionally complete unconsciousness. The cases thus affected are difficult to diagnose from true epilepsy. The attacks may be so severe in rare cases as to closely resemble tetanus itself.

It is now generally admitted that gastric tetany is the result of an auto-intoxication. The decomposing stagnant material in the stomach poisons the blood and nerves, so that the slightest exciting cause may provoke an attack. In not a few instances attacks of the kind have been provoked by lavage of the stomach, but it is highly probable that these were neglected and aggravated cases that could not have recovered under any circumstances, and also that if the lavage had been begun early enough and carried out intelligently at the proper time with the aid of such other treatment, medical, mechanical, or surgical, as was required for the dilatation, there would have been no tetany, and that in many of these cases a cure might have resulted. The therapy of gastric tetany is considered at the end of Lecture XXXIX., in the Treatment of Dilatation of the Stomach.

LECTURE XXXVIII

THE DIAGNOSIS OF DILATATION OF THE STOMACH

WHEN a stomach has once become decidedly dilated, from whatever cause, its most conspicuous local features will be (1) an enlargement of the organ beyond the usual limits of the normal stomach; (2) slowness and often incompleteness in passing its contents on into the duodenum; (3) a flabbiness or relaxed condition of the stomach walls, as shown by the splashing sound over the viscus, elicited in various ways as previously described, and by the lack of resistance felt on palpating deeply the same part of the abdomen.

Incidentally, also, there will be increased fermentation of the ingesta with much gas, which may show itself by eructations or, passing downward, produce an uncomfortable distention of the intestines. In case both orifices of the organ are spasmodically contracted, the stomach itself undergoes marked and more or less painful distention, sometimes so much so that it stands out prominently, and its size and location can then be determined upon simple inspection. In such cases, too, there are often powerful and painful contractions of the stomach walls, which may be visible externally. In dilatation which is at all marked, the percussion note over the stomach is nearly always tympanitic, so that it is not usually difficult to map out its boundaries, even without artificial inflation, by the special method described in Lecture VI. When this is not the case, you can usually succeed in inflating it sufficiently by the method described in the preceding lecture.

Many authors advise inflating by pumping air in through a tube which is first introduced in the usual way, and this is a

very good method ; but, remembering that these lectures are addressed to general practitioners, I am trying to teach the simplest methods which can be depended on to effect the desired result. The tube is indispensable in determining the functional work of the stomach and diagnosing the diseases of its glands, as well as in the treatment of some of its affections. No intragastric instrument, however, is necessary, except in unusual instances, to make out the size and location of the stomach with sufficient exactness for most clinical purposes, and this should always be done at the very first consultation with a dyspeptic, when to insist upon introducing a tube immediately would often prevent any subsequent consultations and thus result in a loss to both patient and physician. As much as possible should be learned first without the tube, and the importance of the knowledge thus acquired, especially if gastric dilatation be demonstrated or a displacement of the stomach, intestines, liver, or kidneys be found, assists greatly in reconciling the patient to less agreeable procedures afterward ; and one or more of these faults you will find, as a rule, in fully one-third to one-half of your chronically ailing women patients.

To establish the diagnosis, then, of dilatation of the stomach you must (1) demonstrate an enlargement of it, and (2) abnormal weakness in its walls. The normal stomach extends from the diaphragm above, at the left, where it is in apposition with the heart, to a point in the middle line midway between the ensiform process of the sternum and the umbilicus or at the lowest one inch above the latter, and from the anterior axillary line, at the left, one and one-half to two inches to the right of the middle line. But considerable variations in the size of the stomach may occur normally. In Germany, stomachs seem to average larger than elsewhere, and a number of German writers hold that one not extending below the level of the umbilicus is not abnormally large ; but a preponderance of other trustworthy evidence is in favor of the dimensions above given.

The accompanying illustrations represent side by side a

normal and a moderately dilated stomach. Figure 51 is an exact reproduction of one in Fleiner's *Krankheiten der Ver-*

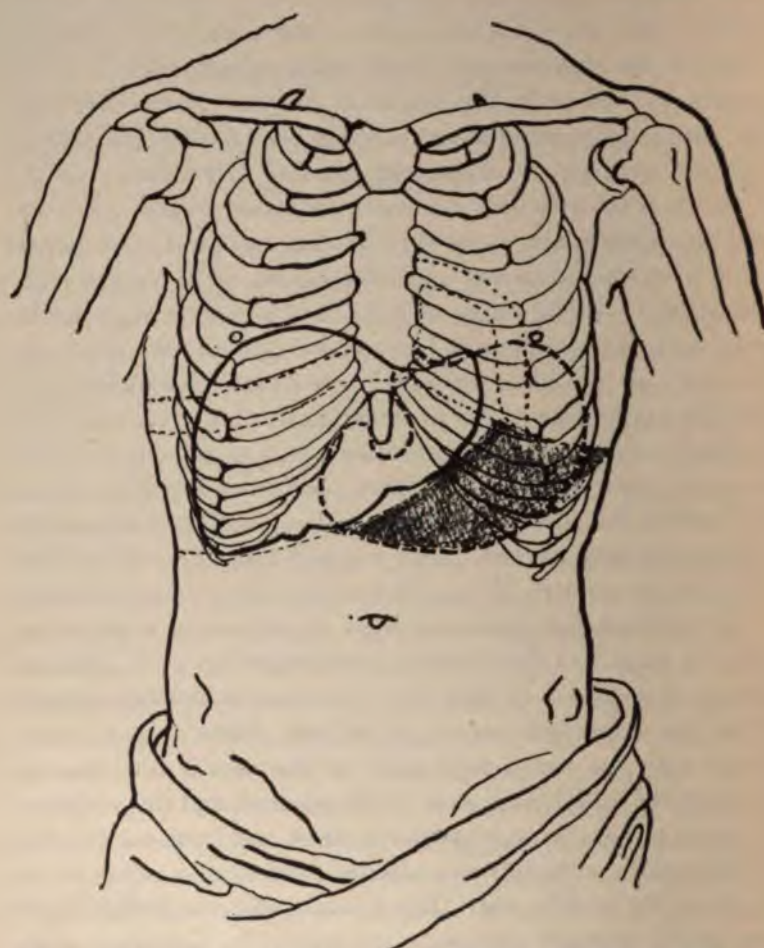


FIG. 51.—Stomach of normal size. The stomach, normal in size and position, is shown by the dashed line, the liver to the right and partly covering it. The shaded part is that in contact with the abdominal wall.

dauungsorgane, and Figure 52 is the same with the stomach enlarged downward and laterally, as it most commonly is in gastrectasis of a not very high grade. In the cases of pyloric

tumors, and in certain atonic cases, a much more extensive dilatation may result.

Figure 51 shows the outlines of a stomach in the normal posi-

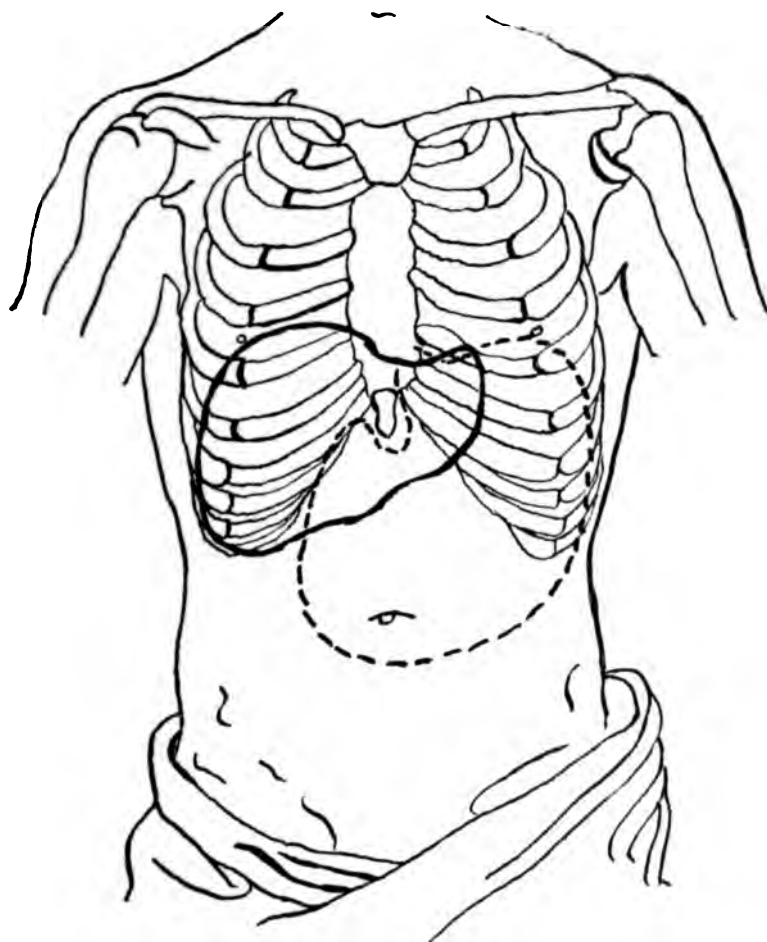


FIG. 52.—The stomach dilated, but not displaced, is shown by the dashed line.

tion and of the average size, as it is usually found in a perfectly healthy young person; and it is noteworthy that in middle or advanced age, especially in persons who have in-

dulged excessively in either food or drink, the stomach is usually larger than during the first half of life. The shaded area in the same illustration shows that part of the stomach usually in contact with the anterior abdominal wall and therefore easily percussed; a relatively small area, you will notice. But not many stomachs of normal size and position will be met with among dyspeptics. The lower border in most cases will be found at or below the navel. When the organ has been fully inflated, except possibly in very fat persons, the lesser curvature and entire fundus can be made out by careful percussion, in spite of the overlying structures.

If percussion should fail, as it almost never does in skilled hands, the best of the instrumental aids to a correct diagnosis are Turck's gyromele or revolving sound, and some one of the forms of apparatus by means of which the interior of the stomach is dimly illuminated by a tiny electric light on the end of a sound. The gyromele affords the most accurate results, since it does not distend the organ any, nor otherwise mislead. Its distal end can easily be palpated, as it wobbles around the outer limits of the viscus. But it must be employed cautiously, and never when an ulcer or cancer is likely to be present. Patients like it even less than they do the tube. Though I have in my office a number of such ingenious intragastric instruments and am familiar with their technique, I rarely employ them, having never yet failed to learn by percussion and the splash, with sufficient exactness for all practical purposes, the size and position of the stomach after inflating it, even in obese patients.

In the more doubtful cases, the aid of auscultatory percussion and auscultatory friction may be necessary; and it may be as well to repeat here that in any case of decided dilatation when liquid is present in the viscus, a splashing sound can be obtained usually by succussion, or by *clapotage* (abrupt tapping over it, with the fingers held perpendicularly to the abdomen). By auscultating with the help of a binaural stethoscope to ascertain over how large a region the splash is heard, the lower and right borders of the stomach can be approximately deter-

mined, though sometimes the splash cannot be heard within an inch or two of the lower border and the full size is then not revealed. Percussion, however, corrects this finding.

To determine the second indispensable factor in gastric dilatation, to wit, deficient motility or a lack of propulsive power



FIG. 53.—Area of tympany in case of gastrectasis with gastropptosis.

in the stomach, the surest method is to withdraw the contents with the help of a tube at sufficient intervals after eating—about three hours after a light carbohydrate meal, and six to seven hours after a large mixed meal, such as a dinner. If then the stomach be found empty, there is no serious lack of motor power, but if much liquid or remains of food are then brought up, the propulsive power is poor, except, of course, when there is obstruction at the pylorus. But when there is enlargement with an easily obtained splashing sound, dilatation is present, either atonic or obstructive. A foamy, yeasty appearance of the contents with a very sour or rancid odor would be also confirmatory evidence of dilatation with stagnation. If food remnants, or even digested chyme, should be found in the

stomach before breakfast, it would show dilatation with retention. The salol test will give you results usually which approximate correctness; and by a further development of the external method of determining the boundaries, I have learned to decide with much exactness when a stomach has emptied itself. After having once fixed the location of the greater curvature, it is only necessary to tap for the splash with the patient recumbent, and percuss with him first recumbent and then standing (especially if the colon has been previously cleared), to decide positively whether or not the stomach is substantially empty. By testing thus at the proper intervals after meals, the motor power can be judged. (See Lecture VI.)

Differential Diagnosis.—Having thus settled the two main points as above described, if there is enlargement with markedly weakened motor power, dilatation exists; but there might possibly be present also gastroplegia, or paralysis of the stomach, a very rare condition, which you may never encounter. The latter comes on suddenly and usually after some severe shock, mental, moral, or physical, especially after an operation. The suddenness of the onset and the completeness of the retention of all food with a swelling in the epigastrium would be diagnostic. Megastria, or simple hypertrophy of the stomach, should never mislead you, since in this disease, though the stomach is enlarged, it is strong, able to empty itself in the proper time, and no marked splashing sound is obtainable even shortly after eating or drinking.

Gastroptosis alone, or downward displacement of the stomach simply, would be distinguished by the fact that the fundus of the stomach and the lesser as well as the greater curvature, would be found too low, as shown by moderately strong percussion after full inflation, or the use of the instrumental methods of exploration previously described. The tympanitic note could not then be heard up to the region of cardiac dullness as normally it should be, except that in the cases of displaced pyloric end, there would be no change in the percussion note over the fundus. Furthermore, unless dilatation should com-

plicate the displacement, as it usually does sooner or later, the signs of insufficient propulsive power would be wanting.

The condition most likely to cause confusion is that form of displacement known as vertical stomach, in which the supports of the pyloric end having become much relaxed and elongated, it drops downward and swings around toward the left until the organ is almost perpendicular in the abdominal cavity. Before such a displaced stomach has secondarily dilated, it could not, of course, show the motor insufficiency of true gastrectasis, and even after such a development you should be able to easily distinguish it by a careful percussion laterally after full inflation. The narrowness of the perpendicular strip of tympany extending down into the pelvis often, with a splash generally obtainable over the same peculiar space only, is quite striking. I lately saw three such cases in new patients during a single week.

Reichmann's disease, in which there is a continual flow of gastric juice, might be mistaken for dilatation if occurring in an abnormally large stomach, since fluid could in such a case be found in the organ at times when it should be empty. But if you wash out such a stomach and then withhold all food and drink from the patient for half a day, fluid would be found present at the end of that time in Reichmann's disease, but not in dilatation. Moreover, in the latter disease, the fluid to be obtained from the fasting stomach or before breakfast is likely to be a very strong gastric juice with little or no food remains and odorless, while in dilatation the contents are malodorous, sour-smelling, and full of partly digested food along with abundant fermentation products.

Hypertrophic enlargement of the stomach without dilatation might also deceive you, if at the same time there should be such an excessive secretion of HCl (hyperchlorhydria) as to produce spasm of the pylorus with temporary retention of the gastric contents; or the same kind of a stomach with such a deficiency of gastric juice (hypochlorhydria, hypopepsia) as to prevent the digestion of the gastric contents, might mislead,

since in this case the contents might exceptionally be retained beyond the usual time, especially if meat imperfectly masticated had formed part of the food taken. In both these cases, however, emptying the stomach with a tube, and a chemical examination of the contents (in the case of marked hypochlorhydria even simple inspection should suffice), would reveal the true cause of the delayed expulsion. Moreover, in the conditions supposed, there would be an absence of the splashing sound, even with the organ partly filled, and this alone would be incompatible with much muscular atony—still more with marked dilatation.

Ewald teaches that we should also differentiate gastric dilatation from an overdistended colon, ovarian cysts, sacculated ascites, hydronephrosis, and echinococcus cysts, but anyone who has learned to percuss out the boundaries of the stomach after inflation could scarcely be misled by any of the above-mentioned diseases. If, however, you should have serious doubt as to the possible presence of any of them, the use of the gyromele in the stomach would enable you to reach a positive decision. In all doubtful cases the examination should be begun with the stomach and colon both empty. You can then afterward introduce fluid into the stomach as required.

LECTURE XXXIX

TREATMENT OF DILATATION OF THE STOMACH

Prognosis.—Gastrectasis, resulting from a mechanical obstruction of the pylorus, has, naturally, the same prognosis as its cause. When this is the cicatrix of a healed ulcer, a benign tumor in or near the outlet, the pressure of a displaced right kidney, inflammatory adhesions between the stomach and any adjacent organ, or a kinking of the duodenum from a downward displacement of the stomach, prompt surgical intervention may often effect a restoration to health; but in cases due to the last-named cause, or to a marked displacement of the right kidney, a resort to the knife is rarely necessary, non-surgical measures usually sufficing, if skillfully carried out and for a sufficient length of time. When the obstruction is due to a malignant growth, a very early diagnosis, followed at once by a removal of the neoplasm, may rescue the patient; but under present prevalent conditions this rarely happens, because the diagnosis is nearly always made too late. The cases dependent upon hyperchlorhydria and the atonic cases are amenable to treatment by dietetic, medicinal, and mechanical means when taken in time, but unfortunately are rarely recognized until they have progressed to an advanced stage and the patient's health has been so badly undermined that the recovery is tedious and difficult.

Treatment.—It is unnecessary to mention here the indications for the surgical operations when a cancer or other tumor obstructs the pylorus, producing gastrectasis and threatening a speedy fatal result, since these are more appropriately discussed in Lecture LXXXII., on the Surgery of the Stomach and Intes-

tines. The other mechanical obstructions calling for surgical intervention are also referred to briefly in the same place; besides they are all fully described in the works on surgery, and the general practitioners who are prepared to open the abdominal cavity in an emergency (as all of you should be) will necessarily have such works at hand. But I need scarcely add that except in a grave emergency admitting of no delay, you should summon the most expert laparotomist obtainable to perform such delicate operations.

It is my purpose to indicate here how you may treat hopefully by non-operative measures the cases of dilatation amenable to such treatment. These measures comprise diet, lavage, abdominal massage, electricity, gymnastics of the trunk muscles, a few medicinal remedies, and all the means by which the health and strength of the patient can be built up, including, in addition to those just mentioned, hydrotherapy, climato-therapy, a judicious alternation of rest and outdoor exercise, etc.

Dilatation from Pyloric Spasm.—Let us consider first a most important class of what may be called the non-surgical dilatations of the stomach—to wit, those dependent upon spasm of the pylorus following severe and generally old neglected cases of hyperchlorhydria or acid gastric catarrh. These are likely to be stubborn, because nearly always accompanied either as cause or consequence by chronic intestinal indigestion and often by intestinal catarrh with neurasthenia and greatly lowered nutrition. The diet, which is most important in all cases of dilatation, is especially so in this form of it and is different from that required for simple atonic dilatation. The articles which usually agree best are milk, cream and butter, eggs, stale bread, toasted (but not too hard, and not the coarsest kinds of bread, which are too irritating), and the partly dextrinized grain foods such as Shredded Wheat Biscuits, Force, Grape Nuts, Malta Vita, etc., taken dry or slightly moistened with milk or water, purées of the blander vegetables, Plasmon (a valuable new proteid made from milk), olive oil and other

fats, beef juice, and often finely chopped beef, but either no meats in the ordinary form, or small portions of them, as well as of fish and oysters; no other shellfish. Nothing irritating or very stimulating to the gastric glands should be allowed, and this rules out entirely the condiments, acids and acid fruits, including tomatoes, and renders generally undesirable the coarser kinds of breads, of cereals and of vegetables, coffee and tea, and the alcoholic beverages without exception. Recent experiments have shown that the fats and sugar are especially efficacious in lessening the secretion of the gastric juice, though they are often contra-indicated by the intestinal complication. The starch foods, except when partly dextrinized, are difficult of digestion in such cases and must be very thoroughly insalivated, as can best be done with the dryer forms long masticated, and all these should be taken very early in a meal—never at the end of it. Even then, in bad cases it is well to give Taka Diastase or some other good diastatic preparation with such foods, or just before meals to assist in converting the starch.

In this, as in all the forms of gastric dilatation, very large meals and any overloading of the stomach with either food or drink must be absolutely prohibited. Whether only two or three moderate meals or a greater number of smaller ones at shorter intervals are to be taken daily is a question to be determined in each case by itself, since no general rule will apply to all. Sometimes frequent small feedings agree well, but less time is then left for the debilitated organ to rest and recuperate between, so that, as a rule, you will probably find the best curative results to follow the plan of giving two or three times a day a moderate amount of bland, digestible food as concentrated in form as possible, so as not to distend unduly, and then, if necessary in bad cases to keep the nutrition up to the proper level, you may have additional nourishment administered by enema once, twice, or oftener daily. The allowance of sufficient liquid with each meal to dilute and thus lessen the acidity of the gastric juice will often assist in relax-

ing the spasm of the pylorus and thus in curing the dilatation; but the amount of liquid taken should never be enough to over-distend the stomach.

No cases are so difficult to diet as those of hyperchlorhydrics, whether or not their stomachs happen to be dilated. In the higher classes of society especially strongly seasoned, stimulating proteid viands usually predominate in the daily diet. Caterers, cooks, and waiters all seem in a conspiracy to force on hyperchlorhydric patients foods and drinks prepared so as to suit especially atonic stomachs, and therefore injuriously irritating for the opposite kind. Then, if, after indulging liberally in the customary stimulating foods and beverages, such a patient suffers from burning pains, as he is very apt to do, the trouble is often aggravated instead of relieved by the treatment prescribed. Whether he tries some quack medicine, consults the drug-store man, or calls in a physician who knows only one form of dyspepsia, the chances are that the remedy depended upon will be a combination of ginger or capsicum with pepsin and a bitter tonic, and often full doses are added of the very drug from an excess of which he is suffering—that is, hydrochloric acid.

Medicines, especially alkalies and antispasmodics, will usually be required in the cases of dilatation dependent upon hyperchlorhydria, and you may administer bicarbonate of sodium in half-teaspoonful, or even one- or two-teaspoonful, doses two hours after meals, or prepared chalk instead when there is diarrhea, or calcined magnesia when there is constipation. Atropine sulphate, grns. $\frac{1}{16}$ to $\frac{1}{8}$ several times a day, may be needed also in the worst cases to control the excessive secretion, and I have found that the addition of 3 to 4 grns. of extract of yerba santa to a pill containing atropine or belladonna and nitrate of silver, grn. $\frac{1}{4}$, tends to the production of more prompt results. But many of these cases resist both diet and the strongest medication for some time, and here intragastric faradization with the current of high tension will prove the most rapidly effective of any means at our command, serv-

ing at once to increase muscular contractions and diminish secretion, as fully explained in Lecture L. on the Treatment of Acid Gastric Catarrh. Massage of the abdomen is contraindicated in all cases of excessive HCl. The necessity for mental and sexual rest cannot be too strongly insisted upon. The excessive HCl secretion sometimes causes an intolerable gastralgia, but in such cases opium and morphine should be avoided, as tending to increase gastric secretion according to recent experiments. Administer instead very large doses of alkalis with atropine either hypodermically or by the mouth, dissolved in warm, not hot water, after emptying the stomach by lavage. This may be followed, when necessary for stubborn pain, by a spray of menthol or cocaine, one grain to the ounce, applied inside the stomach by the Einhorn spray apparatus. Gymnastic exercises designed to strengthen the abdominal and trunk muscles generally assist greatly also in toning up the musculature of the stomach itself, when the hyperacidity has been controlled by the means already discussed.

Intragastric Electricity.—But electricity is the prince of remedies in these cases of dilatation associated with, and often dependent upon, an excessive secretion of HCl. Large doses applied percutaneously through from the spine to the stomach can often help decidedly, as many observers have testified, but with nothing like the certainty and rapidity of effects obtainable by the high-tension induced current (faradism), applied with one pole within the stomach and the other either on the spine or over the epigastrium. Since my discovery of the secretion-lessening action of such a current, its employment for the purpose of reducing hyperchlorhydria has become general. The technique of such applications is fully described in Lecture XXX., under Methods of Treatment. Let me add here, however, that with a suitable electrode such as my modification of Einhorn's, the procedure is not difficult nor troublesome, except for patients who have an irritable stomach. Any form of instrument will answer which carries the current into the water with which the stomach must be partly filled, this water really

acting as the intragastric electrode and distributing the current very gently to all those parts of the viscus with which it is in contact. But the smaller this current-carrier is the better, provided it has sufficient rigidity to be easily introduced. It is very desirable to have the stomach empty when electricity is given in this way, especially if the stomach is inclined to be irritable, and if the possibility of eliciting a splash shows the presence of fluid still in the organ, it is necessary to wash it out before beginning the treatment. No method so certainly tones up the weakened gastric muscles, and at the same time it sooner or later lessens the excessive secretion of HCl; and also of mucus, when there is a complicating catarrhal process.

For reports of several bad cases of dilatation cured in this way see Lecture XLIV. (Splanchnoptosis Concluded, etc.) and also especially Lectures XXIX. and XXX. (Intragastric Methods of Treatment).

Treatment of Atonic Dilatation.—Next let us consider the cases of so-called atonic dilatation. A certain proportion of these probably owe their origin to a former hyperchlorhydria, which through lack of treatment persisted until the gastric glands became exhausted. Under this head of atonic dilatation it will be convenient to class all cases in which there are no indications of obstruction of the pylorus, either mechanical or spasmodic—no tumor, adhesions, or kinks affecting the stomach or the duodenum—and no existing excess of hydrochloric secretion.

In the treatment of this class the diet will differ mainly (1) in not requiring so rigid an exclusion of the irritants, stimulants, and sour things; (2) in not permitting a liberal use of fats, which would lessen still further the gastric secretion and aggravate the indigestion; (3) in requiring a greater restriction of the amount of fluid ingested; and (4) in permitting a much freer use of meats, meat juice, fish, oysters, and all the more digestible forms of animal foods, since the stimulating property of this kind of diet is no objection, but rather an advantage in the atonic conditions now under consideration,

and such foods contain usually a large amount of nourishment in a small bulk. They are besides less fermentable than most other forms of nutriment. But care must be taken that an undue proportion of proteid food is not too long continued, or nutrition will suffer; and it will often be necessary to assist its digestion by administering bitter tonics and artificial digestants at the same time. An exclusive milk diet usually aggravates these cases, on account of the excessive bulk of it necessary, and for this reason the full Weir-Mitchell rest cure, notwithstanding its brilliant success in so many other ailments, frequently fails in patients who have true atonic dilatation of the stomach.

On the other hand, the worst cases will generally respond satisfactorily to a *modified rest treatment*, in which concentrated foods, both proteid and carbohydrate, take the place of milk, especially when, in administering the massage and electricity, an unusual amount of time and attention is devoted to the abdominal region. The abdominal massage, both in gastrectasis and gastroptosis, needs to be given by specially trained manipulators, with the particular object always in view of crowding upward the stomach and intestines while the patient exhales, and effecting contractions of the visceral muscles as well as those of the abdominal wall by very deep and thorough, but never rough or painful, kneading while the patient's hips are kept higher than the shoulders, so that gravity may assist the replacement.

The aggravated cases demanding such modified rest treatment are nearly always in women and are in large part attributable to their exceedingly irrational and unhygienic mode of dress. Hence, when these patients again begin to go about, it should be made plain to them that it will be impossible to complete the cure and make it permanent, unless they will wear instead of the usual corset either a straight-front corset fitted snugly in its lower part only, or better yet a reform waist, which causes only a slight or no constriction of the upper abdominal organs, while it admits of having the skirts all suspended from the shoulders. A snug-fitting elastic belt for

the lower abdomen, however, often proves of great service by limiting the sagging tendency of the viscera.

Faradic electricity, in the atonic cases also, can generally be given effectively through the stomach from front to back, using as full doses as can be borne with the largest-sized electrodes, and this treatment can be repeated daily with advantage for many weeks at a time. More speedy results can be obtained by the employment of the current from a coil having a short coarse wire applied directly to the inner walls of the stomach by means of the intragastric electrode; but this should not, as a rule, be used oftener than every other day, nor be continued longer than four weeks at a time without an intermission of a week or two. During its use, too, the stomach contents should be analyzed at least every two weeks (better every week), to note the effect upon the secretion, which is usually stimulated by such a current at first, but later depressed.

The simpler forms of hydrotherapy applicable in atonic dilatation include cold sponge baths and salt rubs to the whole body, followed by friction with a coarse towel, and locally alternate hot and cold jet douches, or alternate affusions of hot and cold water to the epigastric region.

The gymnastic exercises need not differ from those recommended for the hyperchlorhydric cases. Pulley exercise is often helpful, even for patients in bed, the pulley being attached to the ceiling or foot of the bed; and for others rowing is particularly useful. The series of exercises described in Lecture XXIII. are also very useful.

The cases of atonic dilatation in which downward displacement has contributed to the causation need the same treatment already described, except that in these the abdominal massage, electricity, and exercises need to be more energetically and persistently carried out, and in addition a special abdominal supporter with truss-like springs may be worn constantly with much advantage, except when the patient is in bed. For patients not under regular mechanical treatment strapping the abdomen with strips of adhesive plaster, as described in Lec-

ture XL., affords the most complete palliation possible with also a decided curative tendency. The modified rest treatment is often indispensable in this form of dilatation.

Of course, in all cases of dilatation secondary to tuberculosis, heart disease, Bright's disease, or other systemic affections, no treatment would be effective which did not include especial attention to the primary malady. General debility, anæmia, etc., whether a cause or consequence of the dilatation, would demand their appropriate treatment, which should include all the possible hygienic and climatic aids as well as suitable tonic medication.

In all the forms of gastric dilatation, it is necessary that the stomach should be completely empty at least once in the twenty-four hours. When its propulsive powers cannot effect this (especially in the obstructive forms) lavage must be resorted to. The washing out is best done before breakfast. I shall not discuss here more fully the technique and indications for lavage, since it has been fully considered in Lecture VII.

In addition to lavage for lessening fermentation antiseptic remedies may often prove of some service if the effects are carefully watched. These are fully considered in Lecture XXXIV.

The Treatment of Gastric Tetany is not a promising one, about three-fourths of the reported cases having proved fatal. Narcotic drugs fail to cure by themselves, and naturally so since the disease is believed to be due to poisons formed and retained in the system. Flushing the colon thoroughly with weak alkaline and antiseptic solutions is certainly indicated, both to supply the system with needed liquid and to eliminate poisons. Lavage would be efficient as a cleansing agent, but is not likely to be practicable in a fully developed attack. The administration of nerve sedatives is advisable to lessen as much as possible the abnormal reflex excitability. I would suggest as a safe method of effecting this, either the hypodermic injection of atropine in full doses—grn. $\frac{1}{40}$ —repeated cautiously in smaller doses once in two or three hours till the pupils begin

to dilate, or, what might answer the purpose better, the employment, after irrigating the colon, of enemas containing in solution dram doses of sodium bromide with half-dram doses of chloral, guarded, if necessary to prevent cardiac depression, by 10-grn. doses of camphor.

LECTURE XL

SPLANCHNOPTOSIS, OR DOWNWARD DIS- PLACEMENTS OF THE ABDOMINAL OR- GANS GENERALLY (NEPHROPTOSIS, GASTROPTOSIS, AND ENTEROPTOSIS)— MOVABLE KIDNEY

THESE are associated conditions and several of them are likely to be found coexisting. That is, it is comparatively rare to have one or both of the kidneys prolapsed and movable without finding the stomach and usually also the colon, as well as frequently the small intestines, displaced downward at the same time. It is equally uncommon to find the stomach and colon in abnormal positions with both kidneys in their places, though this may occur. The same causes, a loss of the abdominal fat and weakening of the muscles aided by the mechanical action of the corsets and heavy skirts hung from the waist, permit the customary supports of all these organs at times to give way and their ligaments to be stretched and elongated, so that some or all of them fall or gradually sink to lower positions in the abdominal cavity. The liver and spleen also are liable to be displaced downward.

It was Glénard who, in 1885, first described these displacements and explained their clinical significance, though other writers had previously recognized the possibility of a prolapse of certain of the viscera.

It matters little which one of the various associated ptoses is first considered here, but since the surgeons by the great prominence which they have given to movable kidney (nephroptosis), have familiarized the profession and laity both with this particular displacement much more than with the

others, we may as well begin with it. Probably the most frequent one of the group, however, is gastropotosis, and we shall consider that next.

In a paper entitled *Movable Kidneys; Their Effect upon the Gastric and Intestinal Functions*, which I read before the Medical Society of Pennsylvania in 1901, I discussed this whole subject of the abdominal ptoses rather fully and shall draw largely upon the contents of that paper in this consideration of nephroptosis. I call your attention particularly to the nomenclature of these displacements. Most authors have followed Glénard in applying the term enteroptosis to the entire group of displacements above mentioned, though it is derived from a Greek word meaning intestine and therefore applies appropriately to a descent of the intestines only, and not to that of other organs. I much prefer the now accepted term *splanchnoptosis*, which is derived from a Greek word meaning viscus, and, therefore, is a far better name for the disease which describes a falling of the viscera generally; and the affection is also frequently called Glénard's disease.

Movable Kidneys—Nephroptosis.—Glénard described a sagging of the colon, stomach, and one or both kidneys, the liver being also sometimes involved. Such a dropping of the viscera is exceedingly frequent among women, and Stockton estimates that over half of them are thus afflicted. He says:¹ "The fact that more than 50 per cent. of all civilized women in all classes of life have developed the condition known as enteroptosis, which means that the stomach, intestines, very often the kidneys, and sometimes the liver, are dragged down and remain permanently out of their position, is not generally known. Such, however, is the case; and this condition more than any other cause is responsible for the constipation, back-ache, debility, biliousness, early loss of complexion, headache, and that long list of ailments of which so many women in all civilized countries are victims."

¹ "A Manual of Personal Hygiene," Philadelphia, 1900; Article on Hygiene of Digestive Apparatus, by Charles G. Stockton, M. D., p. 47.

This group of ptoses directly causes a large proportion of uterine displacements, and in such cases the latter are often treated in vain for years by means of pessaries, tampons, etc., and sometimes even by operation, while the unrecognized abnormality above continues its disturbing action, the right kidney, stomach, and colon, all or one or more of them dropping down into the pelvis and resting directly upon the bladder and uterus whenever the patient is upon her feet. Scarcely a month passes in which such aggravated cases are not encountered in my practice.¹

Some of the ablest gynecologists now recognize this sequence of events. Gill Wylie, in recently discussing melancholia, hysteria, hypochondria, etc., said:² "These cases are frequently associated with relaxed abdominal organs, when there are loose kidneys, ptosis of the stomach with omentum and intestines crowding down in the pelvis on top of a retroverted or flexed uterus, and the patients have been treated indefinitely with pessaries for falling of the womb."

Edebohls has referred to the same condition³ and, going further, insists that right movable kidney is often the cause of chronic appendicitis by pressure upon the superior mesenteric vein, a branch of which carries the blood from the appendix.⁴ There is no denying the very frequent coexistence of movable right kidney and chronic thickening of the appendix, and it has been noted by many observers, including myself.

There is much plausibility in Edebohls' view that movable kidney by its pressure may produce a stasis of venous blood in the cecum and appendix and thus gradually cause chronic inflammation in the latter. The same explanation may help to

¹ See reports of cases in Lecture XLIV. further on.

² Anæmia as Observed in a Gynecological Clinic, etc., by W. Gill Wylie, M. D., *Medical Record*, May 20, 1899.

³ Relations of Movable Kidney and Appendicitis to Each Other, etc., by George M. Edebohls, M. D., *Medical Record*, March 11, 1899.

⁴ Chronic Appendicitis the Chief Symptom and Most Important Complication of Movable Right Kidney, by Geo. M. Edebohls, M. D., *The Post-Graduate*, February, 1899.

account for the constipation and chronic catarrh of other portions of the colon which so commonly accompany movable right kidney.

Nephroptosis, or prolapse of the kidney, is conveniently divided into four stages: (1) that in which a part only of the kidney can be felt below the ribs upon very deep inspiration; (2) that in which the entire kidney descends into the flank, between the last rib and the ileum, and usually returns with each expiration; (3) that in which the kidney may be found floating anywhere in the abdominal cavity between the last rib and the pelvis; and (4) that in which the kidney is fixed by adhesions in a wrong position.

Ætiology.—It is of practical value to know that chief among the causes of movable kidney are a lack of development of the abdominal muscles by exercise, and women's very unhygienic dress, including corsets,¹ tight waistbands, and heavy skirts exerting downward traction upon the abdominal walls. The old theory, that pregnancy and its results have most to do with causing loose or floating kidneys, has been disproved. Roskam, in a very recent elaborate article on the subject based upon a study of 147 cases, stated that all but 4 of these were in

¹ Einhorn* considers the corset as an important factor in the causation of the abdominal ptosis, and Kellogg,† as well as Dickinson,‡ has been very emphatic in condemning this injurious article of attire. The latter found that the total pressure of the corset varies between thirty and eighty pounds, and the capacity of the chest for expansion is restricted one-fifth while it is worn. He added: "The abdominal wall is thinned and weakened by the pressure of the stays. The liver suffers more direct pressure and is more frequently displaced than any other organ. The pelvic floor is bulged downward by tight lacing one-third of an inch." Kellogg, in 150 cases of pelvic disease, reports the stomach and bowels displaced in 138.

* Remarks on Enteroptosis, by Max Einhorn, M. D., *Medical Record*, April 13, 1901.

† The Influence of Dress in Producing the Physical Decadence of American Women, by J. H. Kellogg, M. D., *Trans. Mich. State Med. Soc.*, 1891, p. 41.

‡ The Corset, Questions of Pressure and Displacement, by R. L. Dickinson, M. D., *N. Y. Med. Jour.*, November 5, 1887.

women. Of these 143 women, 83 were young girls at the time the ptosis began and only 60 were married.¹

Albarran cited by Roskam reports that of 1176 cases, 87 per cent. were in women; and Küster, quoted by the same, had 97 per cent. of cases among women.

It is nearly always the right kidney which is involved. Edebohls has never seen the left kidney alone movable, nor have I, though Einhorn² and other observers report a very small proportion of such cases. Of Roskam's 147 cases there was but one in which the kidneys were both movable, all the remaining 146 having involved the right side only.

Einhorn reports that of 1912 patients under treatment, 347 had splachnoptosis, that is, Glénard's Disease; 70 of these having been men and 277 women; that out of the same number of patients, 282 had movable kidney, 218 on the right side, 6 on the left (all women) and 58 on both sides; and that 179 of these total cases were in women and 39 in males. In none of the cases among men was the left side involved alone, though in 3 both kidneys were involved.

There are some anatomic peculiarities in the conformation of women that possibly render the kidneys more liable to become movable in them than in men; and another ætiologic fact in them is thought to be a periodic congestion of the kidneys at the menstrual periods. The kidneys may also be dislocated by traumatism such as falls, blows, or strains.

Symptomatology.—The symptoms of movable kidney may include pain, felt nearly always in front over the region of the kidney or below the liver—usually over the site occupied by the displaced organ at the time. There is generally more pain in the first and second stages of the affection than in the third, that of true floating kidney; but in a large proportion of all the cases there is no local pain, except occasionally and sometimes only at long intervals.

¹ *Le rein Mobile et son traitement (traitement chirurgical excepté)* by Dr. Roskam, *Annales de la Société Médicochirurgicale de Liège*, March, 1901.

² See note *, p. 418.

Disturbances of the digestion constitute the most frequent symptoms. These include predominantly pain, or burning, coming on at times shortly after eating, but more commonly toward the height of the digestive period, one to three hours after eating. I had flattered myself that I was the first to observe, in the year 1899, that movable kidney tended powerfully in many cases to stimulate the gastric glands to excessive secretion, the dyspepsia in such cases being generally, at least at first, of the hyperchlorhydric form. I find now, however, that our French confrères seem to have made the same observation before.

Rosewater, of Cleveland, O., in a paper¹ published in the year 1900, referred to gastric hyperacidity as one of the neuroses that may result from enteroptosis. Of the eight cases of the latter reported by him four had movable kidney, and in two of these both the right and left kidneys were thus affected. He also mentioned dilatation of the stomach as a disease that "may result through traction or by pressure of the right kidney upon the pyloric end." He might have added with truth that pressure of the kidney upon the duodenum is equally efficient in causing dilatation of the stomach, and possibly round ulcer, catarrhal, or ulcerative, enteritis or colitis or other affections which, according to Rosewater, may be caused by enteroptosis.

As usual when the HCl of the gastric juice is in large excess, there is much flatulency, sour eructations, often waterbrash, and sometimes crises of severe pain in the stomach, followed by the vomiting of a thin liquid which is so acid as to set the teeth on edge, but without the sour odor of fermenting ingesta. There is very generally constipation also as a result of the HCl excess, even if not from pressure of the displaced kidney upon the duodenum or upon one of the large veins, as mentioned by Edebohls. There are also frequently insomnia, mental depression, and when the mobility of the kidney con-

¹ Enteroptosis Relative to Disorders of the Digestive Tract and Circulation, by N. Rosewater, M. D., *Cleveland Jour. of Med.*, June, 1900.

tinues long, especially when it is a part of a general sagging of the abdominal organs, neurasthenia is almost sure to develop.

The kidney may be very sensitive on palpation, especially in the first two stages of nephroptosis, but, according to my experience, one may quite as frequently meet with kidneys which are movable and in either the first or second position of descent, without being painful on moderate pressure.

In time the stomach may become dilated as a result of the frequent and prolonged pyloric spasm from hyperacidity, or from pressure by the kidney as stated by Rosewater, and then the familiar symptoms of that condition develop, though rarely in the same degree that they do in cases of permanent obstruction of the pylorus as from tumor, or the scar of an ulcer.

Diagnosis of Movable Kidneys.—Displaced or movable kidney can easily be differentiated from any other abnormal condition, and in most cases by palpation alone. The numerous possible symptoms are never by themselves diagnostic, and indeed are often all absent. The kidney must be palpated and recognized by its peculiar shape and smooth feel in its wrong position, and, when freely movable, can be felt to slip through between the fingers with one hand placed over the loin behind and the other in front. With the patient lying supine, her hands loosened and knees flexed (or as Noble¹ prefers, standing and the upper part of the body bent forward almost at right angles while her hands rest upon a table or desk), the physician should press the finger tips of one hand deeply into the loin just below the normal position of the kidney, and press the fingers of the other hand over the corresponding region in front. Then, with the two hands thus brought near together, the patient is caused to breathe in and out very deeply, and if the kidney is movable, it will be plainly felt to slip out on inspiration and return through the fingers to its normal site

¹ Nephrorraphy, by Charles P. Noble, M. D. Presented to the Section on Obstetrics and Diseases of Women, Am. Med. Assoc., June 5-8, 1900.

on forcible expiration with the mouth partly open.¹ (See accompanying illustration.) When this procedure fails to detect it, gentle but deep palpation should be practiced all over the abdomen, while the recumbent patient relaxes as much as possible and continues deep breathing. In this manner a floating kidney which no longer returns to its place, or one



FIG. 54.—Palpation of movable kidney. Reproduced from an article by Henry Morris, in *Lancet*, November 30, 1901.

which is held by adhesions or otherwise in a false position, can generally be discovered, except when it has become fixed behind some other organ.

By percussing over the renal region behind and evoking tympany there where there should be dullness, confirmation may be obtained of the absence of the kidney from its place.

Prognosis.—Clinicians who have had most experience in treating these cases agree that a cure may now be obtained in a certain proportion of them, even without surgical intervention, when the patients can afford to take the necessary care of themselves and be under skilled medical supervision; and when a complete cure cannot be obtained, the patients can nearly always be relieved of the painful and harmful symptoms, and

¹ The above-described method of examining for movable kidney with the patient recumbent was demonstrated to the author by Oser of Vienna, in 1885, and again by Ewald and Kuttner at the former's clinic in Berlin in 1895. Even a very slight mobility can be detected in this way when one has had sufficient practice in palpation.

that, too, very speedily. My own most recent experience has encouraged me to hope for a definite cure in the mild or less aggravated cases by mechanical, hygienic, and medicinal measures in patients possessing the leisure and means to command appropriate treatment. Even nephropexy by no means always cures; after the operation a relapse of the trouble often occurs.

Treatment of Movable Kidneys.—This should begin by confinement to bed under some form or modification of the rest-cure method in all cases in which the movable kidney is either spontaneously painful or tender on palpation. If, even with the patient recumbent, the kidney descends below the ribs during moderate inspiration, retentive apparatus must be put on and worn in bed.

Strapping the Abdomen for Displacements.—At one time I employed in most of my cases of movable kidney an oblong pad, which was attached to an abdominal belt in such a way as to afford support directly to the kidney. This could usually be made to effect the object and in most of the cases prevent any demonstrable prolapse, but was troublesome to adjust by the patient, often uncomfortable and what was worse, sometimes, especially when not skillfully adjusted by the patient or her maid before dressing in the morning, the pressure of the pad seemed to interfere with the return flow of blood from the veins of the lower abdomen, and, in one case at least, I had reason to believe that an aggravation of a previously existing chronic catarrhal appendicitis resulted from this cause. Therefore I have been depending for the last three years upon either a well-fitting elastic abdominal belt, or upon what has proved a much more satisfactory method of retaining movable kidneys as well as other displaced abdominal organs in their normal positions whenever a curative treatment could not be pursued. This is by means of strapping the abdomen with strips of adhesive plaster as first recommended and practiced by Dr. A. Rose of New York, except that in most cases I apply much less of the plaster than Rose does, not finding it necessary

to cover in this way a large part of the lower abdomen. As carried out in my practice, the technique is as follows: While the patient lies on her back with the hips well raised to assist the replacement by gravity, she is directed to exhale several times very forcibly and hold the breath out afterward as long as possible. Meanwhile the physician makes upward pressure with both hands placed over the lower abdomen. In this way it is usually easy to replace the organ completely. After this has been effected the patient should again hold the breath momentarily while the physician applies the first strip of plaster on the right side. In applying this one end of a roll of the best Z. O. adhesive plaster, $2\frac{1}{2}$ inches wide, is attached firmly to the skin as near to the groin on the left side of the body as the pubic hairs will permit, and then brought diagonally upward and to the right, passing usually a little below the umbilicus and on around over the region below the liver anteriorly and the right side of the thorax, to a point near the spine in the mid-dorsal region or sometimes a little higher, the exact course and upper limit of the plaster depending somewhat upon the size and shape of the thorax. After attaching the lower end of the plaster to several inches of the surface it will generally adhere sufficiently to permit of moderate upward traction while the remainder of the strip is applied, or if it does not stick well enough without, an assistant may need to hold one hand firmly over the part first applied while such traction is being made. The first strips of plaster need to be drawn upward with just sufficient force to hold the lower abdomen nearly, but not quite, up to its normal place, else the patient will be rendered uncomfortable and very likely refuse to let them remain; but after wearing them a week or two she will tolerate them better, and full replacement can then usually be effected and maintained by the plaster strips without more than a slight inconvenience. I speak of this in connection with the application of the first strip, since the others must be applied similarly in order to have the abdomen symmetrically supported. The second strip is applied to the opposite side in

an exactly reverse way from the first. In the cases of thin women without much accompanying displacement of the stomach or intestines, I often find one pair of such broad strips of adhesive plaster all-sufficient to maintain adequate support, but in others additional ones are required. In such cases the first pair of strips are placed nearer to the umbilicus and the second adjoining the first on the outer side. When, on account of warm weather or other cause, the strips show a tendency to slip upward, not holding well, I apply other strips transversely over them so as to secure them more firmly. The same precaution is sometimes necessary also on the back.

The foregoing is the technique which I have worked out for myself, not having had the opportunity of seeing Dr. Rose apply the plaster. Doubtless my technique can be improved upon, but it has produced satisfactory results in numerous cases. Occasionally patients having very sensitive skins complain of annoyance from the itching sensation produced by the plaster, and in some a temporary papular eczema is likely to result when it is worn beyond three or four weeks at a time. In such cases I have an elastic belt fitted, to be worn as an abdominal supporter until the skin will again tolerate the plaster. The support furnished by the latter is so much more complete and satisfactory than that obtained from any possible form of belt that most patients are very willing to put up with the comparatively slight inconvenience which it involves. After four to six weeks the plaster strips need to be renewed, in any case, since they have generally become loose in that time, and it is well to have then some sort of a belt worn as a provisional support for a day or two before new strips are applied, so as to allow the skin to be thoroughly cleansed and dried and, I might add, rested, since any skin would be likely to become irritated after a too long continuous application of the plaster.

Other Remedial Measures. Patients who are neurasthenic enough to require the full rest cure, as well as those who need to be recumbent for a while at first because of the very sensitive

condition of the kidneys, will not, as a rule, have to be kept strapped while in bed. In most such cases the movable kidney or kidneys will remain in position so long as the patient is recumbent, or, if not, a simple elastic belt, snugly buckled, will furnish support enough under such circumstances. It is important also during such a rest treatment to have the patient's abdomen unhampered so that really curative measures, such as massage and electricity, can be regularly applied. For the same reason, in the lighter cases of displacement, when these mechanical treatments can be had every day or every other day in the hope of permanently overcoming the abnormal condition, it will be advisable to put up with the less perfect support furnished by a simple elastic belt rather than to apply plaster strips, which somewhat interfere with an effective strengthening of the abdominal muscles by the means mentioned. But, for the large proportion of walking patients, who cannot or will not undergo a systematic treatment which must extend over months, the strapping with plaster affords by all odds the most efficient form of support I have ever tried. Indeed, since having learned how to use it properly I have not been obliged to have the operation of nephropexy performed in a single case. The latter, however, when it shall have been so perfected as to retain the kidney in place during the remainder of the patient's life with a reasonable degree of certainty, will be indicated in many of the more aggravated cases of nephrop-tosis which are not associated with displacements of others of the abdominal organs, or after such other associated displacements have been remedied without overcoming the mobility of the kidney.

Even in these exceptional cases of severe nephroptosis which persist when the stomach and intestines after a long siege with strengthening measures have been restored nearly to their normal positions, there is always some hope of effecting an ultimate cure by fattening the patient when possible, since this restores the normal cushion of flesh which constitutes a large part of Nature's dependence for the support of the kidneys.

The rest cure is a decided help in this direction when otherwise indicated, and is therefore to be recommended in such cases when practicable.

The task of the physician will be, in brief, to fatten and build up his patient in every way, and above all to strengthen her abdominal muscles by exercises specially designed for this purpose, aided, when necessary, by short jet douches or affusions of cold water, as well as by electricity and massage very cautiously given, avoiding irritation of the tender kidneys.

The diet should meanwhile be as nutritious as the patient can take and digest, regard being had, when practicable, to the results of an analysis of the stomach contents after a test meal. These patients are almost invariably thin in flesh, and, therefore, fattening food is particularly suitable, with plenty of rest in a recumbent position, especially after meals, and when this rest can be taken in the open air, it is so much the better.

Drugs are little needed for the displacement or mobility itself, but tonics may sometimes be used temporarily to fortify the constitution, when judiciously prescribed, and the usual remedies for an accompanying hyperchlorhydria are often required at first. In my experience, the cases of movable kidney which are not at rest mentally, physically, and sexually, and which do not yield promptly to treatment, will frequently develop a stubborn form of hyperchlorhydria with its resulting burning pain in the stomach. Sometimes this cannot be controlled even by drugs and diet together with the aid of rest, and will then require a course of high-tension faradism applied intragastrically. The latter method will usually reduce the HCl excess temporarily, but if the kidney be not retained in place by some means, the derangement of secretion will soon recur. Cases not amenable to milder measures should have the operation to anchor the kidney in place—nephropexy. This should always be done when a severe hyperchlorhydria due to the displacement cannot be relieved otherwise, and for all patients who cannot obtain suitable medical and mechanical treatment.

It is proper, however, to state here that the operations for anchoring movable kidneys have not yet attained as great a degree of success as is to be desired. It is estimated that on an average one-third of all such operations in the recent past have failed to hold the kidneys permanently in place.

But different surgeons differ widely in their methods and technique, some passing their sutures through the substance of the kidney itself, others stitching the capsule to adjacent firm structures, and still others not using any sutures to hold up the organ or even its capsule, but depending upon granulation tissue to fix it. No doubt, too, surgeons differ yet more widely in those indeterminable elements of success which are partly, perhaps, a result of large experience and partly of that natural gift or aptitude which makes some men born surgeons. At all events the nephropexies of some surgeons seem to show a much higher percentage of cures than those of others.

LECTURE XLI

SPLANCHNOPTOSIS, CONTINUED. DIS- PLACEMENTS AND DISTORTIONS OF THE STOMACH

THE stomach can be displaced in various ways—upward, downward, (gastroptosis), and in either direction laterally. Occasionally in women it is displaced upward in consequence of the constriction of the corset, when this article of attire is begun to be worn before the stomach has dropped or been enlarged downward; and the level of the constriction is well below the viscus. It may also result from contraction of the left lung and as a sequel of left-side pleurisy or of diaphragmatic pleurisy. This accident is much less likely to produce symptoms than a ptosis or sagging of the organ, and is doubtless often overlooked; but palpitation of the heart might be expected to result from the distention of such a stomach with gas. Such a malposition would not be so likely as the opposite kind of displacement to cause a kinking of the duodenum, and even if it could, the resulting obstruction would produce a dilatation of the stomach which would again carry the greater curvature downward to a level at or below the normal.

Lateral displacements are probably very rare and are likely never to be seen except as a result of the pressure of a tumor, or enlargement of one of the adjacent organs from any cause.

The same methods already described, and those explained below, will enable you to diagnosticate with but little, if any, difficulty either an upward or a lateral displacement of the stomach. The only possible remedies for any of them are to be found in a removal of the cause, whether it be a faulty mode of dress or a morbid growth.

Since downward displacement of the stomach is exceedingly common and the other malpositions very rare in comparison, I will proceed at once to the consideration of this highly important condition.

Gastroptosis.—In the foregoing lecture the whole subject of displacements of the viscera has been gone over so fully that there remains much less to be said about such affections of the stomach and other abdominal organs individually, than would otherwise be required. My own experience goes far toward bearing out the statement of Stockton already quoted, that in effect one-half of all civilized women have a displacement of one or more of the abdominal organs. Since comparatively few of the men are thus affected, and the non-childbearing women do not escape, the inference is obvious that the constricting corsets and dragging skirts worn by the gentler sex almost universally have probably much to do with the causation. The greater curvature of the stomach being normally at about halfway between the ensiform cartilage of the sternum and the umbilicus, it follows that whenever it is found near the umbilicus or below the latter, there must be either a gastroptosis or gastrectasis (dilatation) unless we are able to demonstrate enlargement without weakening of the walls, which would signify merely hypertrophy of the stomach (*megastria*). If at the same time the upper boundary of the stomach, as shown by the position of the lesser curvature and the fundus, is much too low, there exists evidently gastroptosis and not dilatation.

Ætiology.—The causes of gastroptosis are in the main the same as those of nephroptosis, and little space need be occupied with a repetition of them. All authors with but few exceptions agree that prominent among them are the faulty dress of women who almost monopolize the disease, and the wasting diseases that cause a loss of fat. Perhaps you should be informed in this connection also concerning the plausible theory of Glénard, though it is not now generally accepted. He believed that the first step in the chain of causes that led

finally to a dropping of all or several of the abdominal organs, was the fall of the right end of the colon at the hepatic flexure. Downward with this, according to his theory, then goes the entire ascending, and the right half of the transverse, colon so that the latter follows a nearly straight line diagonally from the cecum to the splenic flexure at the left, where there results

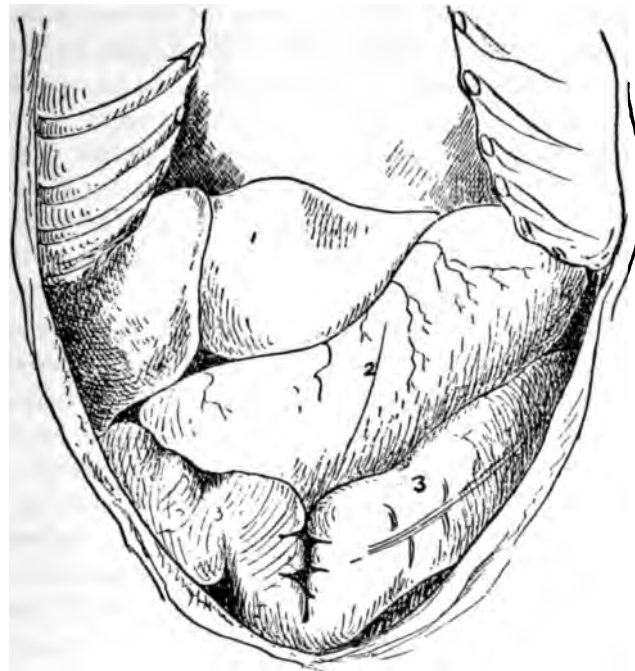


FIG. 55.—Splanchnoptosis with marked gastropptosis, coloptosis, etc. 1, liver. 2, stomach. 3, transverse colon. (From Prof. Dr. C. A. Ewald's "*Krankheiten des Darms und des Bauchfells.*")

a sharp kinking with obstruction of the lumen. In consequence of this obstruction there follows a dilatation of all that part of the colon to the right of the kinking together with stagnation of its contents. The prolapsed transverse colon was then supposed to pull down, one after another, the other viscera whose ligamentous supports have become weakened. Ewald, Kutt-

ner, and others have proved that this theory was not in accord with all the facts, and though the falling of one organ does often produce obstruction by kinking, and though its weight, increased by an abnormal stagnation of its contents, helps to drag down others, the precise order of occurrences described by Glénard cannot be shown to exist as a rule. It is probable that in some cases of aggravated constipation the overloaded colon does first sag and then pull down the stomach with other organs, and quite certain also that in other cases a constantly overloaded stomach sometimes finally gives way (especially in women who lace tightly and let their skirts drag upon their abdominal muscles instead of suspending them from the shoulders), and then crowds down before it the transverse colon; and very likely there may result further a prolapse of one or both kidneys in consequence of the changes in the position of such large viscera.

Symptomatology.—The most constant symptom of gastrop-tosis is constipation, though even this is sometimes absent, and along with this there is usually associated a sluggish digestion, with flatulence, a lowered nerve tone with often insomnia and pronounced neurasthenia. In severe cases anæmia soon develops and ultimately profound debility. When, as usual, there is a complicating muscular insufficiency of the stomach or dilatation, you may observe the inevitable symptoms of such complication, viz., a splashing sound over the stomach, retention of food, greatly increased flatulence and diminution of urine with, in bad cases, vomiting of fermenting stomach contents from time to time. The more common dyspeptic symptoms which you will encounter in moderate cases of gastrop-tosis are sensations of dragging, weight or pressure in the epigastrium, and any of the uncomfortable feelings associated with dys-pepsia except that there is rarely burning or acute pain. The latter generally depends upon an excessive secretion of HCl when not a result of ulcer or cancer, though gastral-gic pains do occur without any ascertainable cause except some fault in the nervous system. When the displacement is not marked and

the gastric muscle still strong, there may be no symptoms at all, and even the bowel movements in such cases may be regular and spontaneous. Regarding disturbances of the gastric secretion as a result, there are differences of opinion, but no sufficient evidence has been adduced to show that either excessive or diminished secretion results as a rule, whereas in nephrop-tosis there is certainly a tendency, at first anyway, to hyper-chlorhydria.

Diagnosis.—Downward displacement of the stomach is often mistaken for dilatation, but cannot easily be confounded with any other condition. To make the differential diagnosis between these two diseases you have merely to determine first the position of the greater curvature which any tyro should be able to do after a few minutes' instruction, by simply practicing percussion and clapotage, as described in Lecture VI., and then by inflating the viscus with carbonic dioxide and percussing again to find the position of the lesser curvature and of the fundus. When both curvatures are too low, you have, of course, gastrop-tosis. After a full inflation so that the stomach shall be markedly tympanitic everywhere, you could not possibly be left in doubt as to the position of any part of the organ. Even when the pylorus and lesser curvature are up under the left lobe of the liver, as they normally are, deep per-cussion will bring out the tympanitic sound. Should there remain a doubt as to the diagnosis, the introduction of Turck's gyromele or the electric lamp (gastrodiaphane) into the stomach would help to solve it. In thin patients, too, a radio-graph of the abdomen should settle the matter.

Prognosis.—Gastrop-tosis can generally be greatly ame-liorated by medical and mechanical treatment and a symptom-atic cure thus effected, though it cannot be radically cured so certainly as atonic dilatation. Restoring the tone of the abdominal muscles by massage and electricity, aided when necessary by hydrop-atic measures, will often go far toward over-coming the milder cases and can markedly lessen the displace-ment in the severer ones, insomuch often that the symptoms are

mostly removed, but in the worst cases in which the ligaments that support the displaced organ have become greatly elongated, a complete cure cannot be promised, unless by means of surgery. When there is a complicating dilatation, intragastric



FIG. 56.—Area of tympany in case of gastropotosis. Author's case.

electricity should be of the greatest service both for its directly stimulating action upon the weakened gastric muscles, and also for its toning effect upon all the structures involved through its stimulant influence upon the sympathetic ganglia behind the stomach.

Treatment.—The same methods of therapy advised for gastric dilatation are worthy of trial in gastropotosis, and if the strengthening mechanical measures already described are persisted with long enough, virtual cures can be effected in the

majority of cases, and symptomatic cures in all except possibly some of the very aggravated ones which are of long standing. For these such ingenious operations as that devised by Beyea are doubtless to be advised, especially in the case of persons who are not in a position to avail themselves of prolonged treatment, and would find it probably impracticable to have the abdomen strapped with strips of adhesive plaster every four or six weeks, as described in Lecture XL., under the head of Displaced or Movable Kidney. Abdominal surgery is becoming constantly safer with the increasing skill of those who practice it, and it is not at all improbable that it will soon be the preferable method of treating the more stubborn cases; but at present the average patient afflicted with a chronic and intractable displacement of one or more of the abdominal organs, would prefer to depend upon elastic belts or specially devised corsets and strapping with adhesive plaster, which will usually, at least, relieve all the symptoms, rather than to incur the risks of a celiotomy for a disease which does not ordinarily endanger life.

For the report of one pronounced case of gastropptosis virtually cured by mechanical treatment, see Lecture XLIV.

Volvulus of the Stomach.—In the English translation of Riegel's "Diseases of the Stomach" (Philadelphia, 1903), Dr. Charles G. Stockton, the editor, interpolates the following note in the article upon Changes in the Position and Form of the Stomach: "The stomach sometimes becomes twisted upon its axis, producing a state that may be called volvulus of the stomach, an instance of which has been reported by Wiesinger. Beck [Berg, the name should be] also has two cases in which he confirmed his diagnosis by operation, resulting in the complete cure of the patients." The foregoing is the only reference to this condition, so far as I have noticed, in any work on gastric affections, or the practice of medicine.

C. D. Spivak of Denver, however, contributed to *American Medicine* of October 31, 1903, an interesting paper on the subject. In this he made an exhaustive study of the literature,

which includes reports of eight cases of the kind. Four of the patients died without any attempt at operative intervention having been made, and at an autopsy it was discovered that the stomach had become twisted upon itself in such a way that its orifices were obstructed, and in several of them portions of the intestines, as well as sometimes the omentum, had been forcibly displaced and involved in the torsion. In two of these cases there were hour-glass contractions, and in several either a tumor or ulcers or cicatrices of former ulcers in one or more of the orifices. The four others were operated with a fatal result in one and recovery in the remainder. The findings were similar to those in the first four mentioned, the stomach having been twisted more or less completely upon itself in all, and in most of the cases either the omentum or some portions of the intestines, or both, were displaced, torn, twisted, or otherwise involved in the tangle.

During life the symptoms were pain, vomiting of an extremely severe and obstinate type, restlessness, prostration, and generally complete obstipation—the symptoms, in short, of obstruction of the bowels, including in most cases great abdominal distention and tympany. Attempts to empty the stomach with the tube were made in several of the cases, but generally failed. Other medical measures seemed to be quite useless. The operation performed consisted of an incision through the abdominal walls, by means of which alone in some of the cases the volvulus could be reduced, but in most of them it was necessary to open the stomach also, so as to relieve the distention, before the reduction could be effected.

Hour-Glass Contraction.—This is a condition of much interest medically as well as surgically, though no medical measures are of any value in overcoming it. It may be either congenital or acquired, most frequently the latter. Its usual cause is ulceration, extending a considerable part of the way around the stomach in its middle portion, or a short distance above the antrum pylori. It is, therefore, a sequel of gastric ulcer. The subsequent contraction divides the viscus into two

more or less unequal parts. Other rarer causes are cancer, inflammatory adhesions of the stomach to neighboring organs, and, very much more rarely, if ever efficient in this way, corrosive gastritis. Tight lacing has enough other sins to answer for, and I do not, therefore, care to follow Riegel in even suggesting that it may be a possible additional cause of hour-glass contractions, especially since it is a very improbable one. This affection is not likely to produce any symptoms in the milder cases, and is then very difficult to diagnosticate; but in the severer forms in which the contraction is very marked, the upper part becomes in time dilated with the usual symptoms of that condition. The diagnosis in such marked cases can often be made after inflation by the peculiar figure formed by the distended stomach. Riegel gives, as a means of diagnosing even mild cases, the fact that a splashing sound may be obtained after an attempt to empty the viscus by the tube has failed; but this could scarcely be a certain diagnostic sign, since the splash may at times be elicited over the transverse colon or cecum, when these are much relaxed and dilated. Stockton, in the American edition of Riegel already cited, mentions a much more certain sign, which should be decisive when it can be obtained. In a suspected case he empties the first portion of the stomach with the tube and then manipulates the abdomen, so as to cause some of the contents of the second cavity to pass into the first. This fluid can then be extracted, and will usually show different reactions from the first, demonstrating that it has been taken from a different cavity. Then, after having the tube arrested at the constriction, Stockton has sometimes succeeded in coaxing it through into the second portion, which would be strong evidence of a stomach divided by some sort of a contraction. As stated above, the only remedy for the condition is a surgical operation.

Abnormally Small Stomachs—Microgastria.—The stomach may be abnormally small as well as large. This condition is likely to be found after a long period of partial starvation or prolonged fasts, and after contraction of the *cardia* has

existed for some months. It may usually be demonstrated by percussion after a full inflation of the viscus, except when the cardia is obstructed, but in the latter cases can only be inferred.

CONGENITAL ANOMALIES OF THE STOMACH

Various abnormalities of the stomach occur at times congenitally. Among these the *forestomach* is really a widened or sacculated condition of the lower part of the esophagus. When the extreme end of the esophagus adjacent to the cardia and below the diaphragm is congenitally dilated, it is called *antrum cardiacum*. These anomalies are not infrequent and generally produce no symptoms, but Riegel is authority for the statement that when coarse particles of food become lodged in such pouches, serious symptoms may result.

Hour-glass contraction of the stomach has already been described as an acquired abnormality which results usually from the cicatrization of an extensive ulcer, but a similar condition is sometimes encountered as a congenital anomaly.

The stomach at birth may also present various abnormalities as to size and form, most of which are not of much clinical importance.

Congenital Stenosis of the Pylorus is, however, a condition which is serious and seems to be comparatively common. Numerous reports of such cases have appeared recently in medical literature.

Shaw¹ has found records of between thirty and forty authentic cases, and many others have doubtless been unrecognized, the resulting deaths having been attributed to marasmus, etc. The children are usually otherwise normal at birth. They show no symptoms until they are from a few days to a few weeks old, when vomiting sets in and nearly always proves fatal—in most cases within two or three weeks, but sometimes not till after several months. At autopsy the stomach is usually found dilated, the intestines empty and collapsed. The pylorus is thickened to about half an inch, from two-thirds to one inch

¹ Brooklyn Med. Jour., May, 1903.

long, exceptionally resistant and usually of conical form. The lumen is greatly diminished, barely admitting a small probe in typical cases, and generally impervious to liquids. In a case reported by Schwyzer,¹ a microscopic examination of sections of the pylorus showed all the layers exceptionally thick and the circular muscular layer greatly hypertrophied.

In some cases characterized by recurrent spells of incoercible vomiting beginning soon after birth, the attacks will at first yield to treatment, showing that the stenosis is incomplete except when aggravated by spasm or inflammatory swelling.

This affection is highly important for pedologists and general practitioners, since it is nearly always fatal sooner or later, unless recognized and surgical intervention invoked.

Treatment, by small doses of calomel and very careful diet—especially small and frequent feedings with the most digestible or predigested liquid foods—assisted, when necessary, by lavage, have often effected apparent cures, when the stenosis has been incomplete, but in time, a more stubborn attack in such cases nearly always occurs, and the child finally succumbs.

When a tumor can be felt in the pyloric region, this, with the symptoms, should make the diagnosis easy, but obstinate vomiting in an otherwise healthy and carefully fed infant should awaken your suspicion that a congenital stenosis of the pylorus may exist, and when the vomiting persists for weeks, in spite of treatment, or frequently recurs without ascertainable cause, an exploratory incision may properly be advised. The risk of this is small, and the pyloric stenosis not operated is inevitably fatal in the end.

¹ *New York Med. Jour.*, November 27, 1897.

LECTURE XLII

SPLANCHNOPTOSIS, CONTINUED—DIS- PLACEMENTS OF THE COLON

Coloptosis.—Displacements of the colon in various directions are exceedingly prevalent—much more so than is usually supposed. You will easily demonstrate the truth of this statement by applying in your practice the instructions given in this series of lectures concerning the determination of the boundaries of the viscera and the diagnosis of abnormalities in them. Hitherto most cases of colonic displacement have not been recognized during life, but in the records of autopsies in the hospitals of the world large numbers of them have been recorded. Among the most valuable of such reports was one contributed at my request to the *International Medical Magazine* (March, 1901) by Dr. W. Wayne Babcock, one of the ablest of the younger surgeons of Philadelphia, at a time when he was assisting me in editing that journal. The paper was entitled Common Anomalies of the Colon. Both by the condensed, but nevertheless graphic, descriptions and by the illustrations of various singularly bizarre dislocations of the colon which it contains, it exemplifies most strikingly the importance of the subject, besides shedding much light upon it, and with Dr. Babcock's consent I have reproduced below his valuable article in full. The curious circumstance noted by Dr. Babcock, that in none of the seven cases of coloptosis described and figured by him was there observed any gastropoptosis or gastrectasis, is very remarkable considering the extreme frequency with which such abnormal conditions are usually found in life associated with displaced colons. The most reasonable explanation for this is, that either these cases

were most anomalous in this respect as well as in the extraordinary positions of the colon, or else that there had been displacements of the stomach which were overcome by the dorsal decubitus and limited dietary during the final illness. It is believed, too, that even very much enlarged stomachs may often undergo considerable atrophy during the protracted illness preceding death, when very little food is taken or retained for weeks or months.

"Of the viscera for which fixed positions are accepted, probably none shows deviations from the usual location so frequently as does the colon. Many of these anomalies of position are clearly explained by imperfections in the developmental process of this part of the intestine. Originating as a portion of a simple tube, the early position of the colon is nearly vertical; the primitive cecum lying above. The developing small intestines, however, soon push the colon to the left side of the abdominal cavity. At first, as the abdominal walls are too imperfect to retain all of the intestines, a portion including the cecum lies through the umbilical opening, and without the splanchnic cavity. With the development of the anterior parietes the cecum recedes into the abdomen, and from a relative position below and to the left it finally passes above and anterior to the duodenum to the right hypochondrium, where it turns downward to its final position in the right inguinal region. This partial rotation of the large bowel forms the transverse and descending portions of the colon and is accompanied by a compensatory partial rotation of the small intestines to the left. An absence of the ascending or of the ascending and the transverse colon, the presence of the cecum upon the left side or in the sac of a congenital inguinal hernia, are conditions satisfactorily explained as due to the failure of the colon to complete this rotation or even to re-enter the abdominal cavity during the process of development. Treves suggests that incomplete rotation of the colon often results from the binding effect of adhesions following a fetal peritonitis.

“ Much more common are the alterations in position and in the form of accessory loops and tortuosities, that seem chiefly to be due to an increase in the total length of the colon, a lack of equable distribution of length in its various portions, or to the abnormal mobility permitted by a mesentery of unusual length.

“ The length of the large bowel is said to vary normally between thirty-nine and seventy-eight inches, and apparently these variations bear no definite relationship to the size and general development of the individual, or to the length of the small intestine. The relative lengths of its constituent portions are also subject to wide variations without the production of evident abnormality. Disproportion without the normal range may result, however, from the persistence of a fetal type in the adult. Thus, in the fetus the sigmoid is greatly exaggerated and attains a length of ten inches. Should the sigmoid, after birth, keep pace with the growth of the rest of the bowel, it is evident that it would soon exceed its normal length in the adult of seventeen inches. Such a progressive growth associated with an elongated meso-sigmoid is probably an important factor in the formation of the unusually long and displaced sigmoids that are so frequent.

“ The transverse colon is also subject to wide variations in length, and considering its lax attachments it is not surprising that deviations from its usual transverse course are common. The cecum shows deviations in position and direction more frequently than does the ascending colon, while congenital anomalies of the descending colon are practically never seen.

“ Displacements or elongations of portions of the colon may also be the result of acquired causes, such as the overloading or overdistention of the bowel, the traction resulting from adhesions, and the pressure from displaced or enlarged organs or from tumors. In none of the cases here recorded, which illustrate common types of deviation in the course of the colon, was such an acquired cause apparent. In no case was the

condition diagnosed during life, nor was it evident that the lesion of the colon was in any case responsible for the fatal result. Unfortunately, the clinical notes describing the abdominal symptoms are found to be very incomplete. The frequent occurrence of these anomalies is shown by the fact that the seven well-marked cases here described occurred in thirty consecutive necropsies which I held at the Philadelphia Hospital during November and December, 1900. Indeed, marked deviations from the usual course of the colon are so common and so frequently are without very evident symptoms, that it is not improbable that a proportion of the reported cases of severe abdominal disorder attributed to this cause may have been founded upon a coincidence rather than a true ætiologic relation. Conversely, it is probable that obstinate constipation, tympany, and other abdominal symptoms of obscure ætiology may depend in quite a proportion of cases upon the elongation, displacement, or tortuous course of portions of the colon. In the investigations for disease of the upper intestinal tract the condition of the large bowel seems frequently to be neglected.

“The precise diagnosis of anomalies of the colon is often difficult. Careful abdominal percussion, aided by the inflation of the bowel through the rectum by water or gas, may frequently fail accurately to outline the colon, especially when there is a marked and complicated deflection. In certain cases the position of the colon is very accurately shown by skiagraphs taken after the large bowel has been filled with an emulsion of bismuth-subnitrate or other substance with a similar resistance to the x-rays.

“Abnormalities of the colon may often interfere with the diagnosis of other abdominal disorders. Thus, in Case I. it would have been very difficult to outline the stomach by the conventional methods, as it was behind a greatly dilated portion of the sigmoid flexure. Such a dilatation might readily have been mistaken for a dilated stomach. The introduction of liquids or gases into the stomach would probably have had

little effect upon the physical signs; while the introduction of a rectal tube might have reduced the area of tympany.

"It has been asserted that the diagnosis between enlargements or tumors of the spleen or left kidney may be accurately determined by inflating the descending colon and ascertaining its relation to the enlargement. This assumes that the transverse colon has its line of attachment external to the left kidney, and that the splenic flexure lies below and internal to the spleen. Assuming that this relation is always borne out in enlargement of these organs, it is evident that in cases similar to I., II., III., or IV., the entrance of gas through the rectum would chiefly distend the elongated and displaced omega loop, which would almost certainly be mistaken for the descending colon. The frequency of these deviations of the sigmoid would indicate the unreliability of the method, especially in those cases in which the colon is found only internal to or below the new growth.

"In many cases the malformation interferes so slightly with the normal physiology of the large intestines that little or no treatment is required. When the symptoms are more severe, various therapeutic measures will suggest themselves upon the determination of the character of the abnormality. In obstinate cases of a severe type, surgical intervention has, in isolated cases, given very encouraging results, and deserves a wider trial. Of the surgical measures the methods of anastomosis or resection of portions of the colon, when feasible, are to be preferred to the commonly employed colotomy with its ensuing discomforts.

"It is significant that in not one of the following cases was there a gastropnoxis or gastrectasis, nor was a single case noticed in the series of thirty necropsies.

"CASE I. Russian, male, tailor, aged fifty, was admitted December 12, 1900, and had suffered from cough, expectoration, and progressively increasing weakness for the past three months. The chest and abdomen are greatly emaciated, the

temperature is of the hectic type, the urine contains hyalin casts and a trace of albumin. The patient is constipated.

"Necropsy, December 31, 1900. The body shows extreme emaciation. The cecum lies in the right inguinal region above the brim of the pelvis. The colon passes upward for 6 cm.

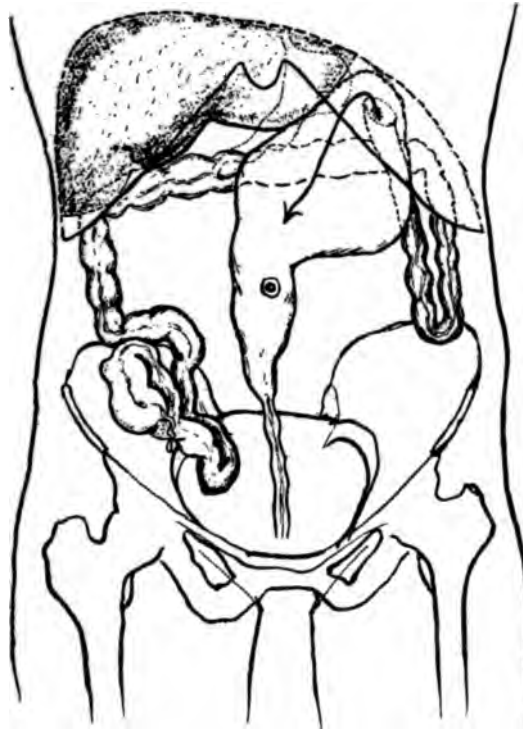


FIG. 57.—Case I. Anomalous course of the first portion of the ascending colon. Unusual course and dilatation of the omega loop. Trilobed stomach.

then bends upon itself and passes downward into the pelvis, curves and returns upward to the concavity of the right ileum, where it forms a third decided curve with its convexity directed upward. It then ascends to the inferior surface of the liver, becomes somewhat distended and crosses transversely to the spleen. Diminishing in caliber, it turns downward to the left pelvic brim. It now bends and ascends along the

descending colon to the diaphragm, where it becomes greatly distended, measuring 12 cm. in its transverse diameter, and lies in front of the preceding portion, the stomach and the median portion of the transverse colon. It now passes downward, becomes constricted just above the promontory of the sacrum, and enters the pelvis. The transverse colon is adherent to the liver. The stomach is narrow and rather elongated, with two distinct constrictions producing three lobes. The upper constriction is a short distance below the cardia and is the more pronounced. The lower constriction is about 5 cm. above the pylorus. Below the duodenum the mucosa of the intestines is the seat of many ulcers until the dilated sigmoid flexure is reached, where the ulcerative process ceases. The ulcers are rounded, shallow, with necrotic irregular bases, and vary from a few mm. to 1 cm. in diameter. They are evidently tubercular. Associated lesions are those of pneumonia, pulmonary tuberculosis, and parenchymatous degeneration of the kidneys.

"CASE II. German, male, laborer, aged sixty-nine, admitted December 12, 1900, complaining of pains in the chest, dyspnoea, and weakness. The family history was obscure. Has been ill with cough and expectoration for a year. There are evidences of consolidation of a large portion of the right lung, but signs of abdominal disease are not found. The clinical diagnosis is phthisis pulmonalis.

"Necropsy December 24, 1900. The body is that of a well-developed, but aged, white man. The ascending transverse and descending portions of the colon follow the conventional course. The ascending as well as the descending colon lies well to the rear. The sigmoid is in the form of a long loop, which touches the transverse colon 6 cm. above the umbilicus and to the left of the median line. The descending portion of the loop passes downward into the pelvis. The liver is 4 cm. above the costal margin. Associated are the lesions of miliary tuberculosis of the right lung with bronchiectasis, marked oedema of both lungs, and parenchymatous degeneration of the kidneys.

"CASE III. Irish, aged seventy-two, housewife, widow. The patient was admitted April 4, 1899, complaining of burning pains in the hands, shoulders, and ankles. She was free from illness until forty years of age, when she had an attack of acute articular rheumatism. This recurred about eighteen

months ago, and became chronic. The face is red and slightly puffy, the extremities œdematous, the joints deformed, the skin shiny. The patient is constipated. No thoracic or abdominal disease is detected. On April 10, 1899, the urine

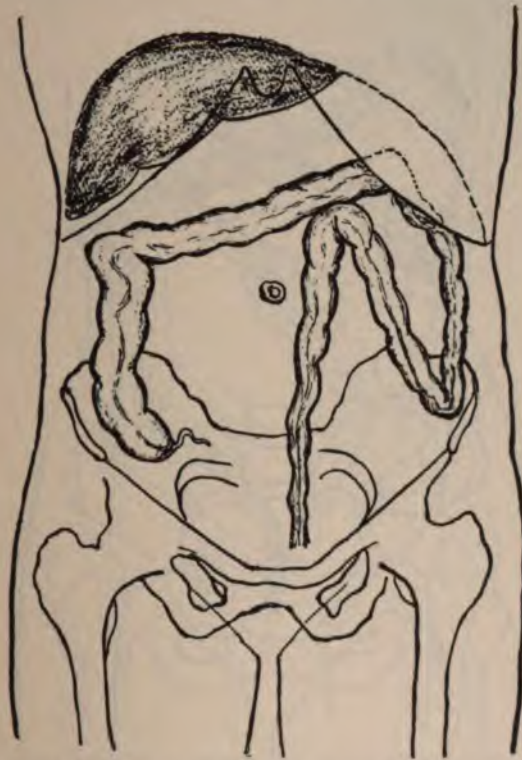


FIG. 58.—Case II. Elongation and displacement of the sigmoid flexure.

was negative; on December 27, 1900, before death, it contained casts and a large amount of albumin.

“The necropsy, December 28, 1900, shows a moderate amount of subcutaneous fat, an exaggerated sigmoid loop, the apex of which is in contact with the lower portion of the left kidney. The intestines are otherwise negative. The stomach is small and elongated. There is an associated right lobar pneumonia, marked pulmonary œdema, and parenchymatous nephritis. The liver has a marked transverse furrow, and

there are several deep vertical grooves upon the anterior upper surface of the right lobe. An accessory renal artery enters the upper pole of the left kidney.

"CASE IV. White, male, aged twenty-two. Admitted December 19, 1900, complaining of cough and expectoration,

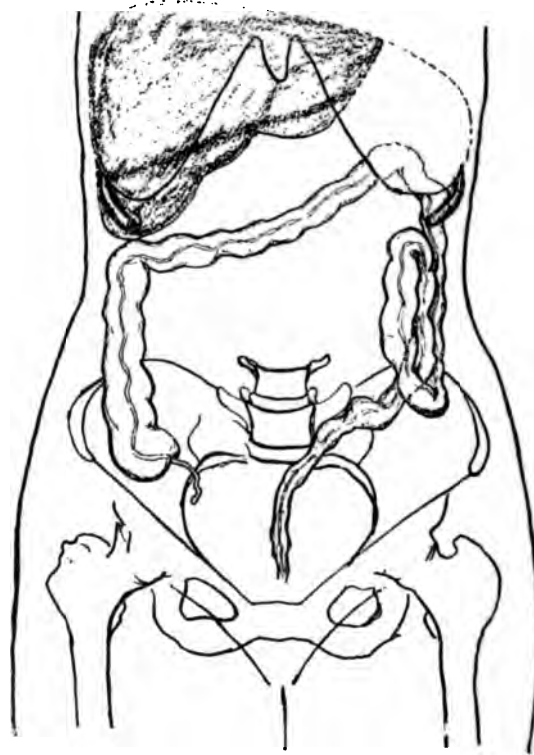


FIG. 59.—Case III. The sigmoid loop touches the lower border of the left kidney. Enlarged liver with marked transverse furrow.

with pain in the chest and abdomen. Has suffered from pain in the epigastrium for the past year. About nineteen days ago had a chill, followed by fever and sweating. The bowels are said to be "regular." (?) He is thin, pale, with crusted lips; dry, furred tongue, and abdominal tympany. The Widal reaction is present and the urine contains hyalin and granular casts. The clinical diagnosis is typhoid fever.

"Necropsy, December 27, 1900. The colon is found to follow the usual course until the sigmoid was reached. This forms a much exaggerated loop. It passes at first upward and to the right until about 4 cm. above and slightly to the right of the umbilicus, where it curves downward and to the

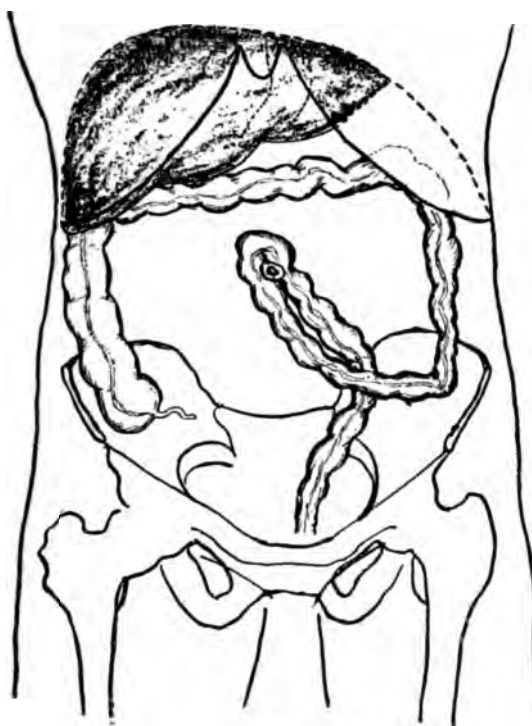


FIG. 60.—Case IV. Exaggerated and displaced sigmoid loop.

left until it reaches the concavity of the left ileum, after which it passes almost directly downward to the rectum. The intestinal adhesions are noted. The ileum contains many typical typhoidal ulcers. A Meckel's diverticulum is present. The spleen is enlarged and hyperæmic; there are areas of submucous ecchymosis in the renal pelvis. The lungs show a congestive œdema. The stomach is very small and covered by the left lobe of the liver. Its position is nearly vertical, the cardia being above and only 2 cm. to the left of the line of the pylorus.

"CASE V. White, male, aged thirty-three, cigar-maker, of rather dissolute habits, admitted December 10, 1900, having suffered for the past month with a pleuro-pneumonia. On admission there was "shifting" dullness over the lower left thorax. A considerable quantity of pus intermixed with air

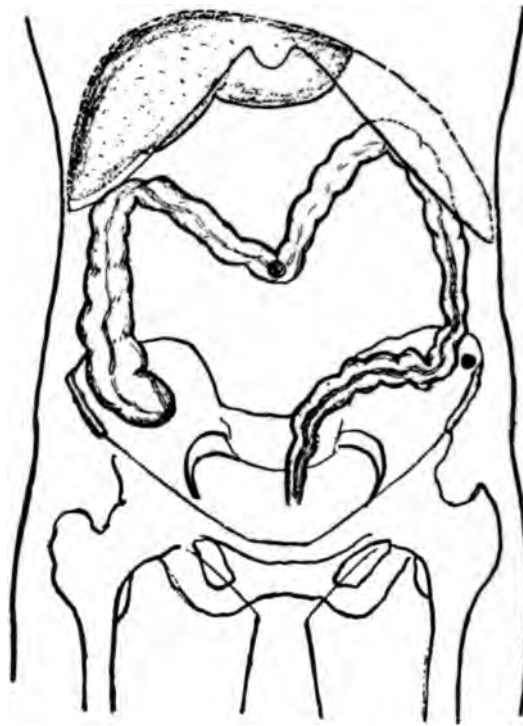


FIG. 61.—Case V. V-shaped course of the transverse colon. The appendix lies behind the cecum within the layers of the meso-cecum.

was withdrawn by aspiration of left thorax. A few days later the man died. No notes relative to the gastro-intestinal condition are found.

"Necropsy, December 14, 1900. The body shows a fair muscular development and is sixty-eight inches in height. The mesentery covers the small intestines. The transverse colon forms the letter V, its apex being at the umbilicus. The hepatic and splenic curves are in their usual positions. The appendix lies behind the cecum, between the folds of the meso-

cecum. The predominant lesions include a large subpleural pulmonary cavity of the left lower lobe with associated atelectasis, and a localized hydrothorax. There is a chronic miliary tuberculosis at the apex of the lungs. The kidneys show cloudy swelling.

“CASE VI. American, white, housewife, aged thirty-eight. Her father died of intestinal tuberculosis. The patient on ad-

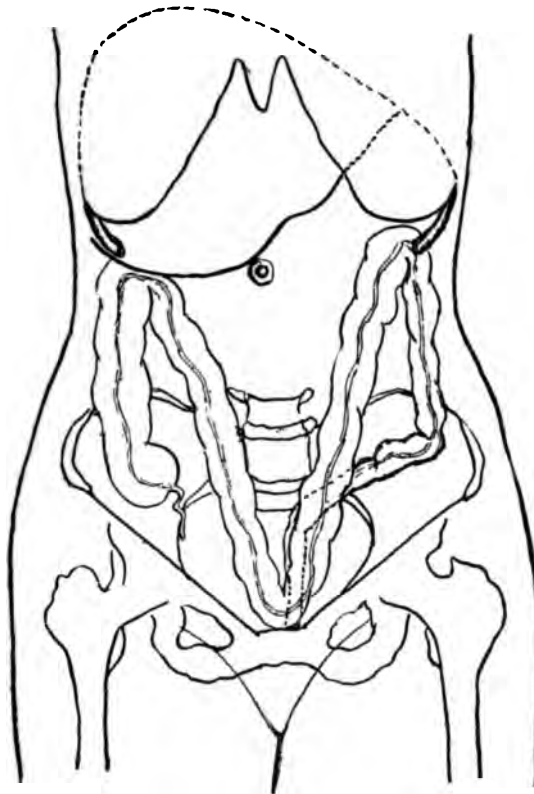


FIG. 62.—Case VI. Exaggerated V-shaped course of the transverse colon. The liver is enlarged from a fatty infiltration.

mission, September 13, 1900, was thin and anæmic and suffered from extensive surface burns received about two months before. There was also a watery diarrhea and abdominal tenderness. The temperature was hectic. The patient de-

veloped delirium and died about three months after admission. The clinical diagnosis was intestinal ulceration.

"Necropsy, December 6, 1900. The body is sixty-one inches in length and shows a moderate degree of emaciation. The subcutaneous abdominal fat was 25 mm. in thickness. The abdominal muscles were poorly developed. Beginning in

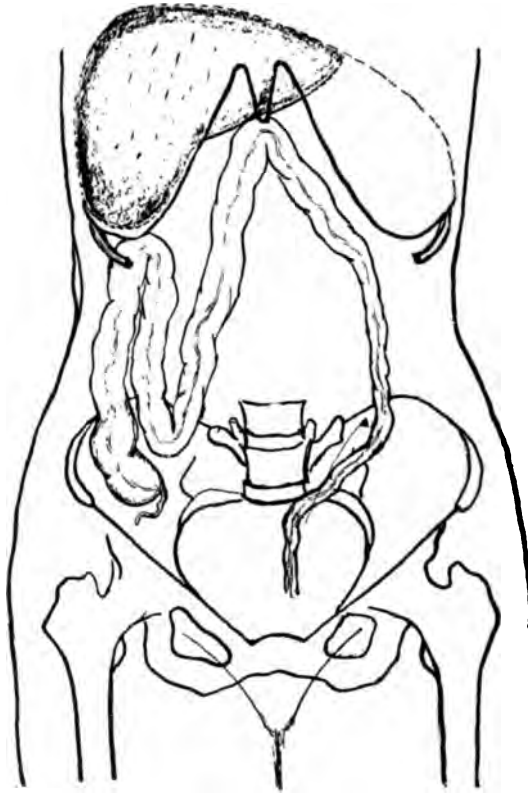


FIG. 63.—Case VII. Anomalous direction of the transverse colon.

the right iliac fossa, the colon ascends in the usual manner to the inferior surface of the liver; it then turns downward and inward to the pubes, from which it ascends to the left inferior costochondral junction and bends transversely inward, forming the sigmoid flexure. The omentum hangs below the colon and is adherent at one point to the uterus. The intestines are not

adherent and are apparently free from other gross lesions. The stomach is so small and contracted as to resemble intestine. It measures 5x25 cm., and its mucosa contains, near the pylorus, a rounded undermined ulcer 2-3 mm. in diameter. The predominant lesions are miliary tuberculosis of the lungs, left pleura, and spleen; fatty infiltration of the liver and parenchymatous degeneration of the kidneys.

"CASE VII. White, housewife, aged thirty-one, height five feet, and of fair development, was admitted to the hospital December 12, 1900, suffering from weakness, depression, and delusions of persecution. These symptoms had appeared after the curettement of the uterus five weeks previous to admission. No abdominal abnormalities were noticed, but special notes relative to the intestinal tract were not taken. The urine contained albumin and casts. The patient sank and died. The clinical diagnosis was uræmia.

"Necropsy, December 24, 1900. The mesentery is found above the colon. The cecum is in its usual position, and the ascending colon ascends nearly vertically to the liver, where the colon bends abruptly upon itself and returns along, and internal to the first portion until the cecum is reached, where it again sharply turns and passes upward to the ensiform appendix. Here the colon again turns downward and somewhat outward to the hollow of the ileum, where it turns transversely inward, becoming continuous with the sigmoid flexure. No lesions of the stomach or small intestines are found. There were no adhesions. The kidneys are apparently the seat of a parenchymatous degeneration."

The Symptoms of Coloptosis.—What is said in Lecture XLIII. concerning the symptoms of dislocations of the small intestines applies with equal force to those of the colon. Constipation is the most frequent one, but may sometimes be replaced by diarrhea, and when the displacement is decided, one of these is usually present, though in exceptional cases the bowels may act normally. Mucous colitis has been said to be a constant symptom, but this is not true. Dragging sensations in the lower abdomen, flatulency, colics, and all grades or forms of minor discomfort in the same region may occur. After reading Dr. Babcock's paper and especially noting the extraor-

dinary contortions which the colon is capable of making, we cannot be surprised that patients whose large bowels have never been mapped out and therefore may be as badly displaced, should complain of persistent abdominal pains and derangements in spite of all sorts of remedial measures empirically applied. It should lead us to see the necessity of determining with the greatest possible care the position and course of the colon in any obscure case of abdominal trouble in which our investigations of the other organs have not helped us to a satisfactory diagnosis and treatment.

Diagnosis.—It is exceedingly rare that an anomalous position of that viscus itself or of any neighboring organ could prevent a well-trained diagnostication from determining the boundaries of the stomach, and this having been done, the position of even a badly twisted or displaced colon should be made out as a rule by inflating it first with warm water and later with air or other gas, especially when both the stomach and colon have previously been emptied. But, if percussion with these helps should fail, you should try to pass through the whole course of the colon a very flexible metal bougie, such as the cable of Turck's gyromele or of my intragastric electrode, which could easily be palpated, and then, if necessary, have made a radiograph of the colon with this *in situ*. This would show all the possible sinuosities and the position of them. As Dr. Babcock says, there would be difficulty in the worst of the above described cases in inflating the entire colon with gas, but a cable of suitable flexibility could nearly always be introduced.

Treatment.—The various hygienic and mechanical measures which I have already described to you, as helpful in overcoming the malpositions of the other viscera, must be relied upon to overcome displacements of the colon. Long percussive sparks from the static machine and the interrupted electric current (faradism) can effect much in bringing up the nerve tone generally and still more by strengthening the muscles of the abdominal wall and of the visceral walls—perhaps also

the tone of the supporting ligaments. Massage skillfully applied helps decidedly in the same direction, as do also rowing and the special exercises for the abdominal muscles which were described in Lecture XXIII., and various hydriatic procedures, especially jets of hot and cold water directed against the bare abdomen. Whatever may be their *modus operandi*, it is certain that a course of treatment embracing several of these methods properly carried out results nearly always in decidedly elevating the displaced viscera including usually the colon, and not infrequently entirely overcome the displacement.

For patients who cannot have such a thorough course of curative treatment the most complete and effectual palliative relief possible can be afforded by the method of strapping the abdomen described in Lecture XL., under the head of The Treatment of Movable Kidneys; and I am inclined to believe (though I have not yet used the method long enough by itself to say this surely) that holding the displaced parts well up for months at a time, by means of such strapping, will conduce much toward a cure. In certain very stubborn cases which are causing serious symptoms, surgical intervention may be necessary and justifiable.

LECTURE XLIII

SPLANCHNOPTOSIS, CONTINUED: DIS- PLACEMENTS OF THE LIVER, SPLEEN, AND SMALL INTESTINES — GENERAL CONSIDERATIONS CONCERNING DIS- PLACEMENTS AND DILATATIONS

Nor more than a very brief account will be given here of the ptoses of the liver and spleen, which have comparatively little to do with diseases of the stomach and intestines. There are no characteristic symptoms by which you may be able certainly to recognize or differentiate any of the above-named displacements. This can only be done by means of the physical signs. The symptoms produced by them are usually indistinguishable from those of gastropptosis, nephropptosis, etc.

Hepatoptosis is not likely to cause any constant or well-defined symptoms, and, as can be well understood, on account of its weight and anatomic position, the liver can scarcely sink downward without causing the right kidney at least, and generally the stomach, to become also displaced. Any symptoms, therefore, could be attributed to the associated displacement of the adjacent organs. A sense of weight or dragging sensation, more pronounced than would follow the falling of the smaller organs, should be expected and will generally be encountered in such cases. Yet, by the physical signs, any displacement of the liver can, as a rule, be promptly ascertained. So large a body can have its boundaries easily mapped out by percussion, whatever its position, except in the case of peculiar abdominal conditions, such as ascites, an ovarian cyst, tumor of the omentum adjoining the liver below, tumor of the right kidney, hydro-thorax or hydro-pneumothorax, perforation of the peri-

toneum with escape of gases into the peritoneal cavity, etc. Those of the above-named conditions which would be likely to present difficulties in the determination of the boundaries of the liver are mostly complications of diseases of such a serious nature that an experienced diagnostician would scarcely fail to recognize them, and these diseases would be of such paramount importance that the presence or absence of hepatoptosis at the same time would scarcely claim very much consideration. An accumulation of feces in the right flexure of the colon, and tumors adjoining it below, might cause a continuation of percussion dullness, resembling that over the liver on down for a little distance over the abdominal cavity, but it is usually possible in such cases to insinuate the fingers between the lower edge of the liver and the other dullness-producing bodies when the effort is skillfully and persistently made. Enlargement of the liver under ordinary circumstances can be readily differentiated from a displacement of it by the increased area of percussion dullness.

The liver may be found in various degrees of ptosis, but the more marked grades of its displacement are so extremely rare that I have personally never seen a case in which the organ sank further than to a point where its lower border appeared two to three inches below the lowest rib with the patient in a standing position, though I am constantly meeting with displaced kidneys, stomachs, and intestines in a considerable proportion of which the prolapse is very marked. I have almost constantly under treatment one or more cases of gastropptosis in which the stomach has descended as far as it can go, resting upon the pelvic organs.

Movable Spleen is occasionally encountered in consequence of the elongation of the gastrosplenic ligament and of the blood-vessels supplying the organ, but is a rare accident, and has only an incidental interest in this connection.

Displacements of the Small Intestines.—When there is hepatoptosis or marked gastropptosis, there must be more or less enteroptosis; both the colon and small intestines, especially the

duodenum, are almost necessarily dislocated as a consequence. But while the position of the colon can generally be determined with an approach to exactness, it is often difficult or impossible to do the same for the small intestines. The development of

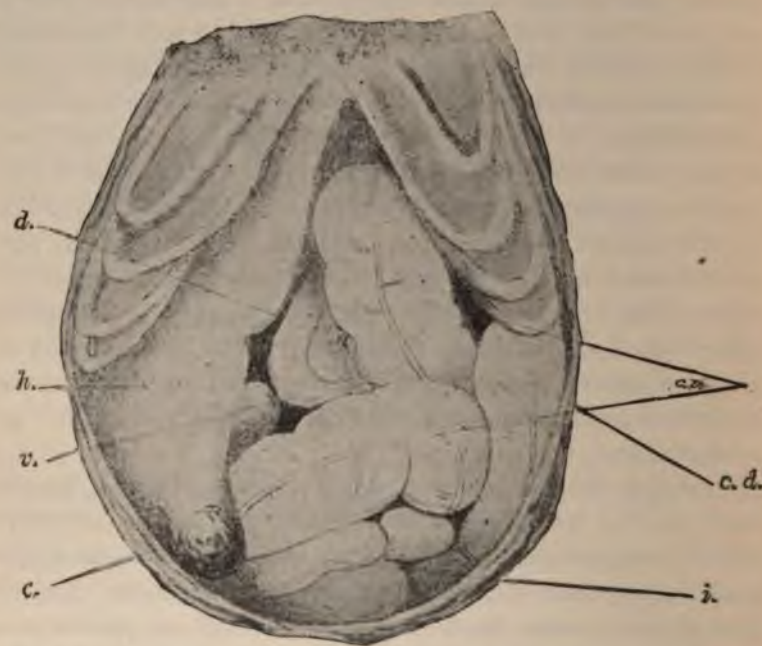


FIG. 64.—Downward displacement of the liver and intestines. (Splanchnoptosis.) *d*, duodenum; *h*, liver; *v*, gallbladder; *c*, carcinoma nodule on the tongue-shaped prolongation of the hepatic lobe, immediately above the symphysis; *c.tr.*, transverse colon; *c.d.*, descending colon; *i*, ileum. (From Prof. Dr. C. A. Ewald's "Krankheiten des Darms und des Bauchfells.")

obstinate constipation following a recognized descent of the stomach would, of course, render it probable that there was a kink in the intestines somewhere, and this is most frequently found at the beginning of the duodenum near the stomach. Indeed, a marked falling of the stomach produces almost unavoidably a flexure of the small gut at this point. (See Fig. 64, showing the ileum displaced into the pelvis.)

The symptoms of a displacement of the small intestines, besides constipation, which results in most cases, though by no means in all, are deranged intestinal digestion with discomfort some hours after eating, incarcerated flatus with rumbling, gurgling (borborygmi), and colicky pains. There may be also any of the symptoms of neurasthenia. After inflating the stomach and colon, and then with the help of percussion, clapping, etc., determining the position of these viscera to be normal or only moderately low, the finding of marked tympany and swelling, or a bulging forward in the lowest parts of the abdominal cavity, would be evidence that the small intestines had undergone a considerable downward displacement.

Treatment.—Many of these ptoses can be decidedly ameliorated by the same forms of treatment recommended for dilatation and displacement of the stomach. Frequent manual replacements of the prolapsed organs while the patient lies on the back with the hips raised, followed by vigorous stimulation of the abdominal muscles through massage, electricity, applications alternately of hot and cold water, etc., with daily exercise of the same muscles by gymnastic exercises, and the wearing of some retentive apparatus, such as either an elastic abdominal supporter or adhesive straps (see Lecture XL.) between times, will often accomplish much in the way of improving the condition and the removal of the symptoms, even if they cannot always definitely cure. Doubtless, in some of these cases, as in the worst of the other displacements, surgery may yet be able to accomplish such successful results and so safely that it will become the proper resource.

Then, of course, all hygienic measures which improve the general health and nerve and muscle tone must assist in remedying the trouble under consideration. Hence, for the stronger patients, active outdoor exercise should be prescribed, such as horseback riding, rowing, golfing, etc., as well as gymnastics for the abdominal muscles, etc. For the weaker ones, a rest-cure is often more suitable. The induced electric current (faradism), locally applied, may usually be hopefully employed in all the

cases. The foregoing measures, together with some sort of abdominal support, will usually benefit greatly any form of abdominal ptosis and effect a cure in many of them.

In a paper which I contributed to the *Therapeutic Gazette* for September, 1899, I discussed at length the various ptoses, their causes and treatment. Extracts from that paper may be usefully inserted here to emphasize some of the more important points already sought to be made, and also to illustrate what can be done in the classes of cases mentioned by means of medical and mechanical forms of treatment. Following are the extracts:

Some Statistics of Displacements, etc.—"A very large proportion of uterine flexions and versions in the non-child-bearing woman certainly, and probably also in parous women, are for the most part a direct mechanical result of the pressure from above of displaced colons heavy with retained feces, and low-lying dilated or displaced stomachs, which after a full meal may often be found resting immediately upon the bladder and uterus.

"Displacements of the abdominal viscera are very much more frequent in women than in men. In a large number of examinations of abdomens of which full records have been preserved, made during a period covering less than three years, and including the cases of 710 different persons, there were 362 patients in whom the greater curvature of the stomach was found at or below the level of the umbilicus as a result of either displacement or dilatation. There were many other cases in which the departures from the normal were present to a less extent. In exceedingly few—in not more than one per cent.—of these 362 displacements and dilatations had the condition been previously recognized, so far as could be learned.

"Of the above mentioned 362 abnormal stomachs, 122 were in men and 240 in women. Almost exactly two-thirds were thus in the female sex and only one-third in males. Of the displacements, in which the whole organ had descended instead

of a part only having been stretched downward, the disproportion is still more striking. There were eighty of these, of which only twenty were in men, and sixty, or just three times as many, in women. This is in spite of the fact that nowadays, in cities at least, outside of the laboring class, a large proportion of men take scarcely more exercise than women, and all classes of men abuse their stomachs far more generally by the pleasures of the table and the temptations of the dramshop. The conclusion is inevitable, therefore, that the great preponderance of this trouble in the weaker sex—weaker mainly because of their hygienic faults—is due largely to the harmful modes of dress prevalent among them. The constricting corset not only limits respiratory movements and tends by its direct compression to force several of the viscera inward and downward, but also keeps the lower thorax and entire abdomen of the wearer in splints, even when not very tightly laced. In this way the muscles of the underlying region—precisely those whose function it is to help support the organs in place—are prevented from obtaining any efficient exercise, so that increasing flabbiness and atrophy of the abdominal walls ensue as a matter of course.

“Further, the heavy dragging skirts, unsupported in the case of most fashionable ladies except by pressure upon the ever-weakening trunk muscles, with some help from the projecting hips, exert, whenever the victim is on her feet, a continual downward traction upon both the relaxing walls and yielding contents of the abdomen.

“In view of these conditions the only wonder is that any woman who has conformed to the requirements of fashion during the years of adolescence (when the structures involved are especially pliant and easily pressed or stretched away from the normal), is to be found with healthful abdominal organs in their proper positions. And since many more young men than formerly, especially soldiers, militiamen, and the cadets in the numerous military schools, have taken to holding up their trousers with tightly buckled belts, which are only less

injurious than corsets, we may expect to meet in the male sex with a larger crop of displaced organs by and by. . . .”

Abdominal Displacements as Causes of Pelvic Disease.—

“ Since writing the foregoing part of this article I have read Dr. W. Gill Wylie’s paper on Anæmia as Observed in a Gynecological Clinic, etc., which appeared in the *Medical Record* of May 20. It is gratifying that this most distinguished gynecologist freely admits the only important point I have made here, which there seemed any likelihood of being disputed—that is, that ptosis of the stomach and colon is a frequent cause of uterine displacements. Referring to cases of ‘ melancholia, hysteria, hypochondria, etc.,’ he says: ‘ These cases are frequently associated with relaxed abdominal organs when there are loose kidneys, ptosis of stomach, with omentum and intestines crowding down in the pelvis *on top of a retroverted or flexed uterus, and the patients have been treated indefinitely with pessaries for falling of the womb,*’ etc.

“ In the same paper Wylie also discusses cancers and ulcers of the stomach and intestines, constipation, chronic appendicitis, obstruction of the gall-ducts, chronic colitis and proctitis, etc., as causes of anæmia. . . .”

A Tribute to American Surgery.—“ The general surgeons, also, are turning to the digestive organs as a fruitful field, and are already pulling up and stitching in place prolapsed stomachs and taking tucks in dilated ones. There are, indeed, conditions in which these new operations may be indicated. . . . When the pylorus is obstructed by a tumor, the cicatrix of a healed ulcer, or other cause which is insuperable by milder measures, or in persons who cannot afford either the time or expense of prolonged treatment by massage, gymnastics (or sometimes a period of rest in bed), intragastric electricity, etc., required to effect a cure, it is entirely proper to invoke the aid of the surgeon. Let us, also, render a full tribute of praise to the untiring energy and genius of the men who have wrought such marvelous results in abdominal surgery in these latter days—especially our American *confrères*, who now stand

unsurpassed in their line. But at the same time, it is just that the equally beneficent and often life-saving work now being done in this region by less dangerous, even if less rapid and brilliant, methods should be given its proper meed of recognition. . . .

"Edebohls puts forward the claim, supported by the dictum of Glénard, that though there may be cases of movable kidney without enteroptosis, there can be no enteroptosis without movable kidney. This statement, notwithstanding the high authority from which it emanates, will not bear the test of clinical experience. Most of the special workers in this field see cases that disprove it. My own records alone show numbers of such. Two of the three cases reported below [in the succeeding lecture] had gastropotosis without nephropotosis."

Of course it is manifest that when the liver falls, the right kidney must be carried down with it, but a gastropotosis would not seem necessarily to involve a nephropotosis, and my observations show that the latter by no means always accompanies it.

LECTURE XLIV

DISPLACEMENTS, ETC., OF THE ABDOMINAL VISCERA, CONCLUDED, WITH REPORTS OF ILLUSTRATIVE CASES

To this subject of the displacements, dilatations, etc., of the abdominal viscera I am devoting what you may consider a disproportionate amount of space and time; but they are among the most frequent, as well as among the more serious, of the affections of the gastro-intestinal tract and at the same time, though very easily recognized after a little instruction as to the proper methods, they are, even at this beginning of the twentieth century, perhaps the most commonly neglected or overlooked of all the disorders that are capable of causing suffering and shortening life.

In the same paper cited in the preceding lecture, I reported the following cases, which illustrate various phases of displacements and dilatations as well as the methods of treatment which may be hopefully employed in the management of them:

Reports of Cases of Displacements of Stomach, Colon, etc.—"CASE I.—A married lady, aged fifty-six, consulted me September 20, 1898. Her weight then was ninety-two pounds, and she had been in ill health for several years, complaining particularly of her stomach. She had had the best of medical advisers before, but had never been examined by a stomach specialist, and the only diagnosis reached, so far as she knew, was dyspepsia and nervous prostration. Her worst complaint was a 'sore, tired, distressed feeling in the pit of the stomach and a constant dragging sensation when on her feet'; also great weakness, a poor appetite, and constipation. She had passed the menopause eight years before. The examination

after inflation with CO₂, showed a marked prolapse of the entire stomach with dilatation, the lesser curvature being just below the lowest ribs, and the greater curvature four inches below the level of the umbilicus. The liver was enlarged decidedly, and the heart was somewhat hypertrophied, the area of dullness extending to the nipple line and the apex beat being found in the same line. The kidneys were in normal position, as demonstrated by repeated careful examinations. Transverse colon pushed downward below stomach. Other organs negative. Analysis of stomach contents showed a slight excess of HCl, but fortunately not enough to contra-indicate abdominal massage. The treatment consisted of a bland and easily digestible diet, special exercises for the abdominal muscles, a special abdominal supporter containing springs which exerted strong upward pressure; full massage, including deep kneading of the abdominal region; galvanism from spine to solar plexus, and also over the course of the pneumogastrics in the neck. Her skin was sallow, almost cachectic, and her countenance showed mental depression. The urine contained an excess of indican. She received in the way of medicine strychnine and hypophosphites for a part of the time, and a mixture of nuclein and bone-marrow later. The Drysdale aperient was given for the bowels. This was a very exceptional case, in that the stomach could not be trained to tolerate a tube or even the fine rheophore of an intragastric electrode, and therefore intragastric electricity, one of the most efficient remedies at our command, could not be given.

"October 6. Her appetite has come up, and the dragging sensation is much relieved.

"November 14. Still weak, but has gained five pounds. Scarcely any discomfort now. Lower border of the stomach one and a half inches below the umbilicus.

"November 21. Stomach extends to umbilicus only. Area of liver dullness normal. No more dragging or distress in stomach. Appetite better.

"December 27. Feels much stronger and better. Can walk eight squares now without getting tired.

"January 24. Still improving; stronger; better color, and good sleep.

"At the last examination, made shortly after this, her stomach had come up so far that the lower border was entirely above the umbilicus. She had not fully recovered her normal

weight and color, but felt so well, as compared with her former condition, that she could not see any necessity for continuing treatment longer.

“The two following cases exemplify further what can now be accomplished without surgery. My records contain scores of cases of Glénard's disease in which not only have the symptoms been either removed or markedly ameliorated without the help of the knife, but also in many of them the prolapsed stomachs have been gradually brought up to nearly their normal positions (as in Case I. above), and the dilated ones, when not due to obstruction, have almost uniformly been contracted until the greater curvature has been brought well up above the level of the umbilicus. Occasionally even the loose kidneys have ceased to be movable or even palpable, and when this failed to be accomplished the pain and tenderness in the affected kidneys in nearly all the cases have been wholly relieved.

Pronounced Gastrectasis.—“CASE II.—Unmarried lady aged twenty-three; came under treatment January 17, 1899. Always well until the previous April, when she had scarlet fever, and following that, according to her own statement, albuminuria. This disappeared two weeks ago. For half a year past she has complained very much of morning nausea, with occasionally nausea all day. Menses irregular of late and very painful. Always very constipated; often several days without a stool. Does not take laxatives except very rarely. Much flatulency, the gas passing freely both ways. Used to ride a wheel, but could not now, being too weak. She was extremely thin in flesh and very anæmic. Examination showed liver enlarged slightly, lungs normal, and heart enlarged about one inch to the left; apex beat also too far to the left. Stomach dilated from normal above to two inches below the level of the umbilicus. Uterus anteflexed and very sensitive to the touch. Left ovary also sensitive, though not appreciably swollen. Much leucorrhea. Findings otherwise negative. Analysis of the stomach contents after Ewald test breakfast showed a total acidity of 40, but no free HCl by the Mintz method, and a small amount of mucus. The urine was found normal by repeated

examinations, except that there was an excess of triple phosphates.

"The treatment included faradism applied directly to the inner walls of the stomach by means of my improved intra-gastric electrode, massage, special exercises for the abdominal muscles, reform dress, and tonic medication, including especially HCl and pepsin; also a careful, but regular use of mild laxatives. The result was fortunate in spite of a severe and stubborn attack of influenza which came on during the treatment, and of a pending marriage engagement with its disturbing influence. She was well enough to discontinue active treatment early in April, and my last entry showed the lower boundary of her stomach to be one and a half inches above the umbilicus, and the liver and heart both within their normal limits. Her bowels were regular without laxatives, and all nausea had disappeared.

Dilated Stomach, Movable Kidney, etc.—"CASE III.—Lady aged thirty, married six years but never pregnant, consulted me September 14, 1898. The chief complaint for which she desired relief was a pain alleged to be in the region of the right ovary, and for which she had received treatment *per vaginam* off and on for five years. She had indigestion after sweets or fried things, and suffered from dizzy spells. She was also nervous, often constipated, and had a sallow complexion.

"Examination showed nothing abnormal in the pelvis, except that the uterus was inclined slightly backward. No swelling or sensitive spots in the adnexa. Liver, heart, and lungs were normal. The stomach was dilated to one inch below the umbilicus, and a light non-nitrogenous luncheon was not yet out of it at the end of three hours, showing bad motility. Splash pronounced even before drinking anything. Right kidney quite movable and also tender. The appendix was also slightly thickened and tender. The stomach contents after the Ewald test breakfast showed no free HCl, but a total acidity of 38; some gastric catarrh.

"Treatment: abdominal supporter, faradism with my intra-gastric electrode, abdominal exercises, massage, lavage, laxatives, and tonics, including HCl.

"Result: December 23 she reported that she felt as well as she ever did, and though all her faulty organs were not anatomically correct, she could not afford to go on with treat-

ment. Her stomach then extended to one inch above the level of the umbilicus instead of an inch below as at first; it emptied itself in about the normal time. There was no longer complaint of pain in the region of either the appendix or the right kidney, which was still somewhat movable. She was symptomatically well, and her gastric dilatation was virtually cured.

Comparison of the Results from Surgical and Mechanical Treatment.—"Most of the points already made are strikingly confirmed in a recent paper by Stengel and Beyea.¹ They report very fully a case occurring in the practice of the late Dr. Wm. Pepper, which was carefully studied by him and by Dr. Stengel. It was that of an unmarried woman of twenty-five with an extreme degree of splanchnoptosis, the stomach having been displaced to within one and a half inches of the pubes, the intestines also displaced downward, and the right kidney dislocated and movable. No reference was made to the condition of the pelvic organs or appendix. There was no history, the authors say, of traumatism, illness, nor of abdominal distention by pregnancy or fluid effusion, to explain the displacement, and they state that 'the cause, therefore, must be considered as most probably compression of the thorax by tight clothing and relaxation of the ligaments.'

"A nephrorrhaphy was first skillfully done by a prominent surgeon and was without marked results, though usually this operation is followed by relief of the symptoms due to the renal mobility. The right kidney continued to be palpable, below its proper position, and often painful. The flatulency, constipation, and other severe gastro-intestinal symptoms persisted. The extreme gastropptosis continued, and the organ even increased in size after the nephrorrhaphy. A year later, in April, 1898, Dr. Beyea did an ingenious operation to bring up and hold the stomach in place. Tucks were taken in the gastrophrenic ligament and in the gastrohepatic omentum. Nine months later the patient was found to have gained in health and weight, and by the end of thirteen months she was decidedly better in all ways. Examination showed the greater curvature one and a half inches below the level of the umbilicus.

"This was a very creditable result for so bad a case, but it is

¹ Gastropptosis; Report of a Case in which a New Operation was Undertaken and the Patient Greatly Improved, *American Journal of the Medical Sciences*, June, 1899.

worthy of particular notice that it was not so favorable a result as was obtained in my Case I., in which non-surgical methods only were employed."

Conclusions.—The following conclusions drawn from the statistics embodied in the paper and from the foregoing reports of cases seem worthy to be repeated and especially emphasized here :

" 1. The fact that over one-half the patients examined at my offices during a period of about three years suffered with displacement or dilatation of either one or several of the abdominal organs, shows the enormous frequency of these serious diseased conditions—a state of affairs little understood or appreciated by the profession at large.

" 2. The fact that, in so far as the patients or their friends were aware, not more than one per cent. of the large number of 362 displacements and dilatations of abdominal organs had been previously diagnosticated, indicates an extraordinary indifference to this important class of cases on the part of physicians generally.

" 3. There is a deplorable lack of knowledge of what can be, and is being, done in abdominal displacements and dilatations by simple, safe, and efficient, even though often tedious, non-operative methods."

In summing up this whole subject of the abdominal displacements—splanchnoptosis—let me impress upon you as strongly as possible, both for the prevention and cure of them (in so far as a cure is possible), the importance of hygienic living. That is, there should be regular and systematic exercise of the abdominal muscles, and the clothes worn should always admit of such exercise, instead of being virtual abdominal splints which, by preventing any proper exercise of those muscles, allow them to become weakened and relaxed and finally atrophied so that they cannot possibly support the viscera. Besides, you should use your utmost endeavors to see that your patients do not drag down their abdominal viscera by heavy skirts hung

from the waist instead of from the shoulder, or by overloading their stomachs with indigestible food in amounts twice as great as their activities require.

It is quite possible that you may not accomplish much at first in thus stoutly opposing the irrational dictates of Fashion, but you will have at least performed a duty, and have helped to sow seed that must bear fruit by and by.

LECTURE XLV

ACUTE AND SUBACUTE GASTRITIS

UNDER the above general head it will be convenient, and pathologically as accurate as our present knowledge will permit, to group the following affections of the stomach: 1. Simple acute gastric catarrh; 2, the more or less transient gastric attacks which, though usually afebrile, resemble acute gastritis, except in their comparative mildness, often called acute indigestion in this country and England, and denominated by the French *embarass gastrique*, while the Germans, according to Ewald, call the same condition *status gastricus*; and, 3, the other forms of gastric inflammation which run a short course, usually to their termination either in death or recovery, including toxic, phlegmonous, sympathetic, and infectious and parasitic or mycotic gastritis. The more chronic forms of gastritis, including the ordinary and the sthenic or acid type, will then receive separate consideration later.

Pathology of the Gastric Inflammations.—From analogy, as well as from actual observation, we may infer that pathologic alterations similar to those in other mucous membranes occur in the mucosa of the stomach, though for obvious reasons the lighter forms of inflammation cannot be so satisfactorily studied in the latter. Generally speaking, inflammation is a progressive process expressive of a reaction of the tissues to an irritant which is not strong enough to cause death. A constant characteristic of inflammation is the invasion of new tissue elements—blood and lymph cells, wandering connective tissue cells, etc. The elements of protection and repair underlie the inflammatory process, and even if retrogressive changes take place, as suppuration and necrosis, they are accompanied by

progressive changes in the tissues immediately surrounding the degenerated areas.

Inasmuch as inflammation is invariably the result of irritation, the degrees of the inflammatory process will vary with the strength and nature of the irritant. The difference between a simple slight gastritis which can hardly be distinguished from a simple hyperæmia and a gastritis resulting in destruction of the parts involved, is only one of degree and not of kind. Gastritis, therefore, is a collective term covering such processes as simple acute and chronic gastritis, phlegmonous or purulent gastritis, toxic gastritis, and other inflammations of the gastric mucosa.

Simple Acute Gastritis.—This is a common affection, especially in the hot season of the year. Its most frequent cause being spoiled or decomposed food, especially animal food, it is naturally most prevalent when the weather predisposes most to putrefactive processes. Those who suffer from it are probably in the main persons having atonic or dilated stomachs, as well as those whose stomachs are either in a condition of chronic catarrh or at least insufficiently supplied with gastric juice. But even a perfectly healthy person, one whose stomach is sound and digestion ordinarily normal, can, doubtless, be attacked with acute gastritis in consequence of having ingested food in which decomposition has developed a sufficient number of pathogenic bacteria or their toxins. Our knowledge of the pathology of this condition is imperfect for the reason that it is very rarely fatal, and even when a patient does chance to die from the effects of it, the post-mortem changes are so rapid that the exact alterations in the mucosa due to the disease cannot usually be determined. The inflammation, however, involves both the superficial columnar epithelium and the glandular parenchyma. The histologic changes are out of proportion to the symptoms. The surface of the mucous membrane is covered by a tough, glassy, cloudy mucus. The mucosa is hyperæmic and swollen, the hyperæmia being, as a rule, limited to, or at least most marked in, the pyloric region. Ecchymotic

spots are scattered throughout the mucosa. The microscope reveals destruction of the superficial epithelium and round-cell infiltration. Degeneration of the organic cells may take place.

The symptoms of simple acute gastritis are, doubtless, familiar to all of you. They are severe pain in the region of the stomach, coming on after a longer or shorter stage of invasion, during which there is usually much nausea, thirst, headache, a full, distended feeling in the stomach, and generally fever. With increasing pain and distress, vomiting develops, and quantities of undigested, sour, fermenting, and very often very offensive liquid or semi-solid matter are brought up, with usually a temporary relief of the pain. With appropriate treatment, including especially rest of the whole body in bed and particularly entire rest of the gastric functions, such an attack almost invariably ends in two, three, or four days, so far as the acute symptoms are concerned. Not, infrequently, however, there is left behind a milder catarrhal process in either the stomach or bowels, which is then the cause of a persistently furred tongue, lack of appetite, and constipation or diarrhea, or at least, an uncomfortable sensation in the colon, which is characteristic of a moderate catarrhal inflammation there.

Acute gastritis may occasionally be simulated by vomiting of nervous origin, and cases of the latter may even be associated with paroxysms of severe gastric pain—gastralgia.

The diagnosis turns mainly on the presence or absence of fever as well as of tenderness on deep palpation. With acute gastritis there is usually some fever, and always more or less marked tenderness on deep pressure over the stomach, though tenderness may exist also in nervous vomiting because of disease in the solar plexus. Then, in the neurotic cases, the vomiting is more apt to be intermittent, as well as less responsive to simple treatment.

It is noteworthy, however, that in most of these so-called nervous affections of the stomach, a thorough examination reveals some pathologic condition in either the stomach or intestines—chronic catarrh somewhere in the alimentary

tract, displacement or dilatation of the stomach, or, very frequently, a movable kidney. Occasionally the cause is a latent gastric ulcer or undemonstrable carcinoma.

Acute febrile catarrhs of the stomach are less frequently seen in adults than in young children, and in the latter probably involve also usually the duodenum at least, if not the whole small intestine. Such cases cannot always be distinguished from beginning meningitis, typhoid fever, malaria, or other fevers at first, though by a careful process of exclusion the diagnosis can usually be made within a short time.

The Treatment of Acute Gastritis is simple enough when you can control the patient and friends, and prevent aggravation of the disease as a result of putting into the stomach irritating foods, drinks, or medicines.

Three harmful things are often done: 1. The patients themselves usually insist upon drinking large draughts of water which has been rendered irritating to the inflamed mucous membrane by the addition of ice or lemon juice, or some other sharp acid.

2. The friends are apt to insist upon the patient's taking food, in spite of his positive repugnance to it, and notwithstanding the fact that it is rarely ever retained.

3. The attending physician, if taught, as many of us were, that the chief remedy for vomiting is bismuth, too often stuffs frequent full doses of that or some other equally useless and disturbing drug into the protesting stomach.

Bismuth, in such acute conditions, is usually useless and disturbing, because the whole system is suffering from a toxæmia which calls loudly for elimination and a free action of all the emunctories, including especially the liver and the intestines, while this drug inhibits somewhat the action of both, valuable as it is in purely local inflammatory lesions of the stomach, as in gastric ulcer, etc. I well remember my first case of acute gastritis, which occurred shortly after I had begun practice in Atlantic City. The patient was an elderly lady with doubtless a dilated stomach (though I could not have determined then

whether it was within normal limits or filled the whole abdominal cavity), and she had been eating excessively of various rich viands, including oysters out of season. I promptly prescribed bismuth in 10-grain doses, which were rejected as soon as swallowed, as was also water and everything else that she took. During my absence, some other old lady put on a mustard plaster, which immediately gave relief, and, with entire abstinence from food, recovery was thereafter rapid.

The chief indications to be met by treatment are (1) rest of the inflamed organ, and (2) elimination, that is, removal of any remaining particles of fermenting or putrefying food, as well as of the previously formed toxins.

As digestion will have been completely arrested, you will, of course, withhold all food for twelve to twenty-four hours at least, or even till the acute stage is over, especially in adults; and as you are dealing with a highly inflamed membrane, you will avoid making matters worse by administering any remedies that, by reason of their taste, smell, or other mechanical properties, could either further irritate that membrane or excite reflexly the vomiting center. And unless the pain is so violent as to make the duty of instantly relieving it outweigh all other considerations, you will not lock in the toxic products by giving opiates.

Besides observing the foregoing cautions as to what not to do or permit to be done, you may usually shorten somewhat the period of cure and often at the same time lessen the discomfort of the patient, by a few simple remedial measures. Considerable alleviation often results from a wet pack or compress applied directly over the stomach, the moisture to be well confined by an oiled silk or some other impervious cover, and the whole held firmly against the body by a flannel binder. This is usually applied cold, but when there is a violent, colicky pain, it is better to have it as hot as possible, and even to increase its counter-irritant properties by sprinkling turpentine on it.

For the purpose of more thoroughly emptying the stomach

than nature can accomplish unaided, emetics have been suggested, but are decidedly contra-indicated, and the tube which has been recommended by some authorities is better avoided in these acute cases, except as a last resort, though often indispensable in chronic gastric catarrh. The best method is to have the patient, when an adult, drink very freely of warm or tepid water—not less than a pint at a time—which, being promptly vomited, will usually empty finally every corner or pocket of the stomach. Let this be taken several times, at intervals of ten or fifteen minutes, after which marked relief of all symptoms nearly always follows. Having thus thoroughly evacuated and cleansed the stomach, you should limit fluids by the mouth to not more than half-ounce drinks (or, in babies, at first teaspoonful doses) of plain, moderately cooled water—not ice-cold, as a rule. Sometimes, however, *in these small quantities*, even iced water agrees well. Small pieces of ice, swallowed at intervals, suit better than water, and in severe adynamic cases they can often be administered with advantage in teaspoonful or tablespoonful doses of a dry champagne at half-hour intervals.

Medicinal Remedies.—When medicines are necessary, the most useful one at this stage I have always found to be calomel in doses of one-sixth grain for adults, or one-twelfth grain for infants, *taken dry on the tongue, without more than one grain of sugar of milk as a diluent, and without any fluid to wash it down.* Repeat the dose in bad cases every half-hour till it produces copious yellow stools. When administered strictly as above directed, it is almost never vomited, and the effect is nearly always most happy.

Another remedy of approved value is arsenite of copper, but it must be given in very minute doses in order not to disagree. You may dissolve one of the $\frac{1}{16}$ -grain tablets in five or six teaspoonfuls of water, and, when the symptoms are very obstinate, administer a teaspoonful every half-hour, in alternation with the calomel powders. (See Lecture XXXIV.)

Both the calomel and cuprum arsenite are equally helpful

when the gastritis is complicated by diarrhea, with thin, watery or offensive stools. In that case the calomel will need to be stopped as soon as the change in the character of the stools shows its action.

When violent pain persists after the stomach has been completely emptied, it means, usually, that a portion of the fermenting gastric contents has passed into the intestines and affected that region. The action of the calomel may, in such cases, have to be supplemented by copious enemas, to which sulphate of magnesia, or even castor oil and turpentine, may be added, if necessary. These enemas are also desirable in the cases marked by obstinate constipation, which the calomel alone does not speedily overcome.

When the acute stage is over, bismuth often proves the best remedy for the subacute catarrhal condition which tends to linger and become chronic in some cases. It needs to be borne in mind that an often unrecognized chronic gastritis is one of the most frequent predisposing causes of acute attacks. After evacuating the bowels thoroughly, it may be necessary to resort to rectal alimentation in stubborn cases, especially when the patients are weak. As the attack subsides, feeding by the mouth should be begun again, and cautiously increased. Among the first things to agree will probably be clam broth, peptonized milk, whey or fresh milk prepared with Eskay's Food. This last is a very valuable addition to our stock of suitable preparations in case of debilitated or irritable stomachs, whether in adults or children. Bovinine, Plasmon, Mosquera's Beef Meal, and other beef powders are also suitable for addition to milk or broths. Full feeding must then be very gradually resumed. See Lecture XX. for detailed dietetic suggestions and lists of foods from which you may select during the convalescence from various gastro-intestinal affections.

Subacute Gastritis.—The affection which we call indigestion and the French *embarras gastrique*, does not, except by its comparative mildness, differ greatly in its ætiology, symptoms, or therapeutic requirements from acute gastritis, and it

is a fair inference, therefore, that it does not differ essentially from it pathologically. As already stated, I do not believe there can be a marked functional disturbance without some anatomic basis for it, however slight or transient. Possibly the attacks of acute indigestion which fall short of the severity which would entitle them to be classed under acute gastritis, have no greater pathologic basis than a hyperæmia, but I suspect that many of them, if the mucosa could be examined at their height, would show a subacute inflammatory process. At least it seems logical to assume this; but proof is lacking, since persons do not die of such attacks. The treatment should be practically the same as for acute gastritis—evacuation of the stomach and calomel first, and bismuth with stomachics later. As in the severer form, too, abstinence from all food and hot applications or counter-irritants over the epigastrium are very useful in the beginning, and drinking hot water proves helpful whether it provokes emesis and thus gets rid of the irritant, or only dilutes the latter.

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LECTURE XLVI

ACUTE AND SUBACUTE GASTRITIS, CONCLUDED—SYMPATHETIC, TOXIC, PHLEGMONOUS, AND INFECTIOUS AND PARASITIC GASTRITIS

Sympathetic Gastritis.—Ewald describes separately gastritis sympathetica, which is the form of the disease encountered in the exanthems and the infectious fevers as typhoid, malarial fever, etc. It is well known that in many of the graver cases of fever there is an associated gastritis, and Ewald considers this to be a result, in such cases, of a reflex nervous action. The pathology of these cases is not different in all probability from that of simple acute gastritis. The symptoms are often masked and the treatment, when any other than that required for the primary affection is practicable, should follow the same lines as in the simple acute form.

Toxic Gastritis is next in frequency and importance to the forms already described. In fact all the varieties of gastritis are of either toxic or bacterial origin and, therefore, the term toxic gastritis does not entirely differentiate the affection under consideration. It is that form of inflammation of the gastric mucosa due to the action of powerful poisons introduced from without, especially the caustic acids and alkalies, many of the metals as arsenic, phosphorus, etc., and other irritant drugs. Such substances are often swallowed either accidentally or purposely with suicidal intent, and the result is likely to be very serious, death, in the case of the more caustic substances, frequently being caused by a perforative peritonitis, and when this is prevented, destructive inflammation may be set up, especially if the poison is swallowed in a concentrated form

and at a time when the stomach is empty. The more diluted the chemical taken and the greater the amount of gastric contents to which it is added, the less sudden and violent naturally the effect. The metal poisons produce generally a less violent gastritis, though when taken in large enough amounts, death results quite as certainly from their absorption into the system.

The pathology depends first of all upon whether an actual caustic substance, or some other irritant poison of non-corrosive effect has been taken. The pathologic conditions vary also with the amount and concentration of the poisons ingested. There may be only a slight superficial inflammation or the entire mucosa may be destroyed. The general effect of the corrosive poisons is the production of eschars, which may be tough or friable, or loose in texture. These eschars vary in color with the different chemicals. They may be brown or black from the disintegrated blood or after the ingestion of sulphuric acid; orange-yellow from the ingestion of nitric acid; white or grayish from oxalic acid; white or gray from carbolic acid or mercury. Severe hemorrhages, ulcerations, and perforations may be the results of such poisoning. The mineral poisons in large doses produce mucoid and fatty degeneration of the epithelial cells and a whitish or yellowish appearance of the mucosa. Other poisons in dilute form may cause appearances not unlike those present in simple acute gastritis.

The symptoms of toxic gastritis are a severe burning pain and vomiting which is especially characterized by the fact that, unlike vomiting in most other cases, it increases the pain. There are also seen extreme thirst, fever, prostration, and when perforation with peritonitis results there will be collapse and the other usual phenomena of that serious condition.

The diagnosis turns mainly upon the history, and when some caustic or violently irritant chemical has been swallowed, you will find a blistered or eroded condition of the mouth and throat. In all these cases, too, there is an exceptionally rapid development of the symptoms; but to differentiate between some of the forms of metal poisoning, as from arsenic or

antimony on the one hand, and some of the forms of ptomain poisoning on the other, is by no means easy; in the latter there is a more intense prostration and also dilatation of the pupils.

The treatment of toxic gastritis demands a prompt evacuation of the stomach whenever possible, and to wait for the administration of an emetic means usually the loss of precious time. In this form of gastritis there is an even greater necessity for emptying the stomach immediately and thoroughly than in the simple acute, and you should not hesitate to wash it out with the help of the tube, when it is possible to introduce it, except when a caustic substance has been taken. The next step must be to administer the appropriate antidotes, both chemic and physiologic, and after that to treat the corroded membranes locally by mixtures of bismuth and limewater or other emollient and healing remedies.

In alcoholic gastritis, which may be considered a subvariety of the toxic form, the treatment may be much the same as in simple gastritis, except that considerable stimulation and an earlier resumption of feeding will be necessary. Beef extracts, raw eggs, and other strongly concentrated nutriments will be in order, though the milk preparations advised for the ordinary type will also be appropriate. Bismuth and limewater often prove curative in this form after the extreme irritability of the first stage has been measurably abated. Drop doses of Fowler's solution have been lauded in this affection, but the minute doses of cuprum arsenite already mentioned have helped more in my hands. These are cases in which the sufferers, on account of the unquenchable thirst, are most inclined to go on drinking large amounts of iced water or other drinks, in spite of the fact that they are immediately vomited. I have often seen a slop jar filled with gallons of fluid which has, within a few hours, been poured down by such a patient, only to return instantly, with the result of increasing the irritability. In addition to carefully regulated doses of stimulants, general nerve sedatives are usually indispensable in such an aggravated condition.

Phlegmonous or Purulent Gastritis.—This is at the same time one of the most dangerous and one of the rarest diseases of the stomach. Ewald, when he wrote the first edition of his book, on “Diseases of the Stomach,” had seen only one case of it and this in hospital. It is situated in the submucous and muscular layers and is nearly always acute. It occurs mostly in men and is most frequent in the active period of adult life—from twenty to sixty years of age. Ewald considers the disease to be due to bacterial invasion. It may result from the extension of a perigastric abscess or as a metastasis from various acute infectious diseases, especially pyemia, puerperal fever, etc., and it may be either diffused or circumscribed.

The pathology of this variety of gastritis calls for no extended statement. The abscesses may be very small—pea or hazelnut size—or very much larger.

The inflammation, having begun in the submucous connective tissue, extends thence to the mucosa. The pyloric portion is generally invaded more than the other regions of the stomach. The submucosa is swollen, oedematous, purulent, or infiltrated with blood. The process, extending to the mucosa, produces minute perforations in the latter, imparting to it the appearance of a sieve. Through these perforations pus exudes. The muscularis mucosa is also involved, showing infiltration with pus cells and proliferation of nuclei. The involvement of the peritoneal layer may lead to perforation.

The symptoms of gastric phlegmon are more intense than those in any other variety of gastritis and include fever which may be very high,—even 105° F.,—violent pain coming on generally rather suddenly, though sometimes preceded by vague symptoms, great thirst, and a general feeling of serious illness. There is nearly always vomiting, which brings up mucus and biliary matter with sometimes much pus; also either constipation or diarrhea. Extreme restlessness, jactitation, and delirium are other striking symptoms. The prostration is marked and death is likely to occur in coma.

The diagnosis is difficult, if not impossible, during life. Both Leube and Ewald have put on record their belief that it cannot be certainly diagnosticated. But the suddenness of the onset and extreme violence of the pain, vomiting, and other symptoms, with increased resistance over the stomach, should always suggest to you the possibility of the existence of this disease.

The treatment is extremely unpromising, and unless the diagnosis can be made in time to admit of surgical intervention, nothing can be done in most cases except to allay the pain by icebags and morphine hypodermically and powerful stimulation to counteract collapse.

Infectious and Parasitic Gastritis.—Every gastric inflammation must be accompanied by more or less infection, but numerous authors hold that in certain cases of acute gastritis which run a more severe and protracted course than usual, a bacterial infection is the direct exciting cause. In another class of gastric inflammations closely related to these, the mucosa, presumably weakened so that its resisting power is lessened, is invaded by pathogenic fungi and other larger parasites which produce a form of gastritis.

When the invading organisms are fungi, the term *mycotic gastritis* is appropriately used to describe the resulting affection. The gastric mucosa may be invaded by diphtheria bacilli, giving rise to a pseudo-membranous inflammation, or, in rare cases, the anthrax bacillus may invade the mucosa, giving rise to inflammation and necrosis. A fibrinous gastritis may be caused by the favus fungus and may accompany pyemia, septicemia, puerperal fever, scarlet fever, smallpox, typhus, etc. Thrush fungus, the yeast fungus, and animal parasites may give rise to inflammation and ulceration of the gastric mucosa.

Considerable literature has accumulated regarding these forms of gastritis, but the views concerning them are still largely theoretical. Infectious gastritis is not generally regarded as entitled to be considered in a separate class and

neither it nor the mycotic form has such well-defined distinguishing symptoms that it can be certainly diagnosticated from the other varieties. The treatment, supposing the diagnosis to have been made, must be practically the same as for simple acute gastritis.

LECTURE XLVII

CHRONIC ASTHENIC GASTRITIS (CHRONIC GASTRIC CATARRH)

WITHOUT attempting to go deeply into the mooted questions relative to the exact histology of the different forms of chronic inflammation of the gastric mucosa and its glands, I shall discuss here as plainly as possible the more practically important aspects of the subject.

Different Forms of Chronic Gastritis.—The former view that chronic gastritis is a simple inflammatory process involving always a decrease of the HCl and ferments, along with an increased secretion of mucus, has had to be abandoned, though it dies hard. Boas, Riegel, Einhorn, Hemmeter, Van Valzah and Nisbet, and others have established beyond question the fact confirmed by hundreds of other observers that cases of chronic gastritis constantly occur in which there is either a normal or excessive secretion of HCl and the ferments. Boas calls these *gastritis acida* or acid gastric catarrh. A further study of gastritis has revealed the fact that while in the same stomach the mucosa in different parts may sometimes exceptionally show different conditions, the secreting cells in one place undergoing a degenerative process and in another a proliferative one at the same time or at different times, there is usually a predominance of glandular hyperplasia in the cases characterized by excessive secretion, and a preponderance of degenerative processes in the glands of those showing a deficiency of secretion.

If one were to construct a pathology of chronic gastritis by a process of reasoning *a priori* instead of by observations at the bedside or in the consultation room or laboratory, one

would be led very naturally to the view that in every such inflammation there must be at first full or excessive functional activity and later a gradual degeneration or atrophy of the secreting cells, with finally an absence of secretion. But the physician who not only studies his cases from the clinical side symptomatically, but also determines the proportion of HCl, etc., in the gastric contents of each dyspeptic patient, besides examining microscopically fragments from the wash water, does not have to examine in this way many hundreds of cases before he finds convincing evidence that the facts are quite different—that while some comparatively young persons suffering with chronic gastritis will show a persistent absence or low percentage of HCl (chronic gastritis anacida), numerous patients who are even up in the seventies will present the very opposite condition, *i. e.*, a form of chronic gastritis with a constantly excessive secretion of the gastric juice; and fragments of mucosa may be obtained from the wash water in the one case which will reveal many proliferating glandular cell elements, while from the other may often be secured evidences of a predominating glandular degeneration.

Besides these two widely different types of chronic gastritis, which not all authors yet recognize, the disease is also divided into a primary and secondary form, secondary gastritis being in the nature of a complication of various other diseases, as tuberculosis, nephritis, heart disease, hepatic affections, gastric carcinoma, etc. Mucous gastritis is another variety which many authors consider entitled to separate consideration, and the asthenic form with deficient secretion tends to develop ultimately into what some authors class as a separate form—*i. e.*, chronic atrophic gastritis, in which all the elements of the gastric juice are wanting.

Still another type has been called *chronic hypertrophic gastritis*, in which the connective tissue proliferates markedly and the glandular structures are atrophied by compression. This process causes much thickening of the gastric walls with usually contraction of the viscus when it is general, but en-

largement with finally dilatation when the connective tissue of the pyloric part is mainly involved. In the latter cases the pylorus undergoes hypertrophy and obstruction of the out-

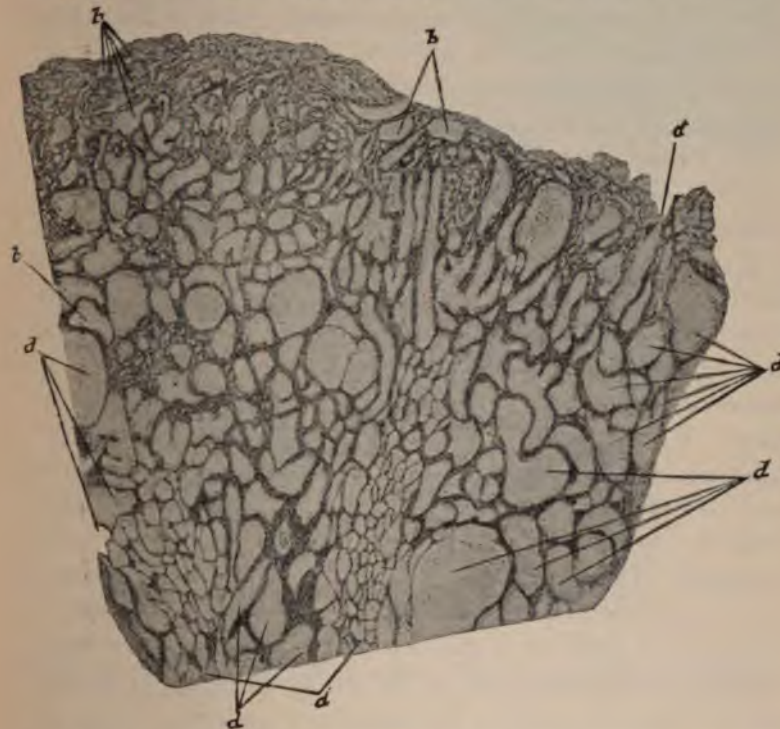


FIG. 65.—Muroid and cystic degeneration of the gastric mucous membrane in a case of chronic tuberculosis, $\times 25$. *a*, small cyst, not lined with epithelium; *b*, blood-vessels; *c*, gastric gland opening on the surface; *d*, medium-sized cysts, for the most part lined with epithelium, chiefly composed of goblet cells. At the surface of the mucous membrane there is a great increase of the interstitial tissue. (R. Langerhans.)

let results. These have been classed by some writers under the head of *chronic stenosing gastritis*.

While in its severe typical form chronic asthenic gastritis (ordinary chronic gastric catarrh) does not seem to be as prevalent in this country as in Europe, for the reason probably that there is a less widespread abuse of alcoholic liquors and

tobacco here, mild forms of the affection are common enough and often pass unrecognized. It is very frequently treated as nervous dyspepsia with drugs or rest cures, and sometimes by external hydrotherapeutic measures mainly, until finally, when the intestines have become involved in the catarrhal process, and serious impairment of the general nutrition has resulted, special advice and treatment are sought.

The Pathology of Chronic Gastritis in General.—There is a general manifestation of long-continued irritation which is common to all chronic inflammation of mucous membranes. As a rule it brings about proliferation of connective tissue and destruction of the more highly organized parenchymatous tissue. The destruction of the latter takes place either by the direct action of the irritant on the parenchymatous cells, or by reason of the encroachment of the proliferating connective tissue. It is in this manner that cirrhosis of the liver, interstitial nephritis, fibroid phthisis, etc., occur. In chronic gastritis of the ordinary asthenic type the same general phenomenon is observed, though with many variations as above explained. The glandular elements become degenerated, while the connective tissue is proliferated. The pathologic changes vary with the duration of the disease and are present not only in the mucosa, but in the deeper layers of the gastric wall.

In the early stages the mucosa is œdematous, wrinkled, loose, and more or less reddened. Hemorrhage or ulceration may occur. The mucous membrane is covered with a dull gray mucus containing epithelial and pus cells. Later the epithelium and the glands become degenerated, and infiltration of the gastric wall with lymphoid cells and hyperplasia of fibrous tissue between the glands takes place. This accounts for the thickening of the mucosa. In many cases the infiltration and proliferation occur in discrete areas, giving rise to flat, prominent, and granular portions. The projecting parts formed by the fibrous tissue may form distinct nipple-like prominences, giving rise to a condition called *état mameloné*.

Occasionally, circumscribed growths made up of mucoïd or glandular tissue may form, constituting what is known as gastritis polyposa. In protracted cases the hyperæmia disappears; the mucous membrane is pale gray in color; the

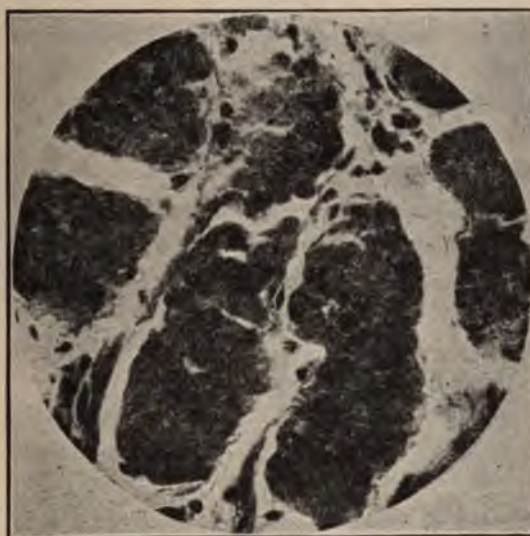


FIG. 66.—Gastric catarrh: fatty degeneration of the glands, early stage. From a photograph, $\times 350$. From a case of pulmonary tuberculosis. The gastric glands are swollen, and the outlines of the cells are completely lost; the nuclei have disappeared in parts, and the cells are more granular than normal, fatty granules being also seen. The stroma is normal. From a preparation hardened in Marchi's fluid, and stained with logwood. (From Sidney Martin's "Diseases of the Stomach.")

glands become atrophied, and the stroma shrinks, owing to cicatricial contraction.

Symptomatology.—The symptoms of a mild asthenic catarrh of the stomach, as well as of simple HCl excess (hyperchlorhydria), are frequently entirely wanting, the patient claiming to be well; but when there is a nervous complication or much fermentation, the symptoms will be briefly those of what is commonly called flatulent dyspepsia. They include

fullness and vague uneasiness, amounting sometimes to pain in the gastric region, coming on shortly after meals and followed a little later by more or less copious eructations of gas, which may be sour and offensive in taste and smell. There is



FIG. 67.—Atrophy of the mucous membrane of the stomach with polyposis. *a*, mucous membrane, normal in appearance; *b*, smooth and atrophied mucous membrane; *c*, polypi. (Ziegler.)

usually some impairment of appetite, which may go on to complete anorexia in advanced cases, with occasional nausea. In the alcoholic cases and those complicated by marked mus-

cular atony or dilatation of the stomach, there is vomiting of sour fermenting ingesta—sometimes of glairy mucus only. This is a constant symptom in those cases especially which are complicated by obstruction to the onward propulsion of the gastric contents, whether in the pylorus or duodenum. Spas-

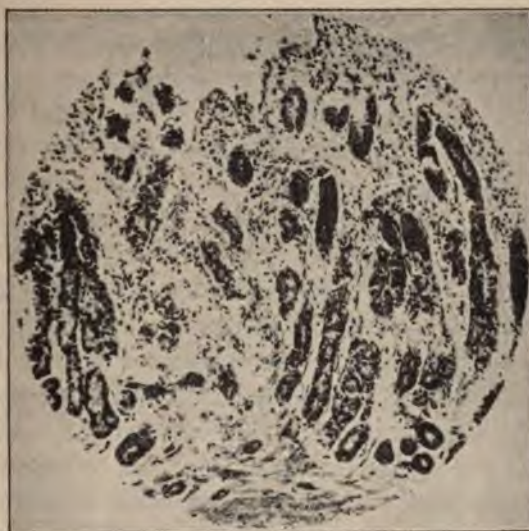


FIG. 68.—Fibrosis in gastric catarrh. From a photograph, $\times 70$. From a case of catarrh in pulmonary tuberculosis. The gastric glands are in a state of atrophy, and are widely separated by recently-formed connective tissue, rich in cells. The mucous membrane had lost its epithelial lining. The other coats of the organ were normal. From a preparation hardened in Marchi's fluid, and stained with logwood. (From Sidney Martin's "Diseases of the Stomach.")

modic or mechanical vomiting is rare in other cases, except in acute exacerbations. Heartburn and water-brash may or may not be present. The tongue is usually more or less coated, with an accompanying bad taste in the mouth. But none of these symptoms are diagnostic. You may have a foul tongue and breath from an unhealthy mouth and nasopharynx, without catarrh of the stomach, especially when there is gastric fermentation from other causes; and, on the con-

trary, there may be a clean tongue and the absence of bad taste or belching with a pronounced gastric catarrh, though it is truth to say that this latter combination is much more rarely seen in the form of gastritis now under consideration than in the acid form, in which there is uniformly present an excessive secretion of the gastric juice, along with a large quantity of mucus.

Many and diverse nervous symptoms, including frequently out-and-out neurasthenia, nearly always complicate fully developed and advanced gastric catarrh, and when the case has not been properly treated in the beginning, the intestines are sooner or later affected. Then either constipation or diarrhea, or these two conditions in alternation, will almost surely develop.

Diagnosis.—It is not possible to make a certain diagnosis of chronic asthenic catarrh of the stomach without the use of the tube and the more important quantitative tests of the stomach contents described in Lecture X. The advanced cases with vomiting and pain can easily be confounded with cancer or ulcer, and the earlier or milder ones are constantly mistaken for nervous dyspepsia. Then, even when occasional vomiting of large amounts of mucus without coexisting pain, tumor, cachexia, or emaciation makes it probable that a catarrhal inflammation exists rather than either ulcer or malignant disease, you would have no means of determining, except by testing the stomach contents, whether the process were on the one hand a proliferating one, accompanied by an excessive secretion of HCl and demanding the blandest possible diet with alkalies and sedatives in the way of medication, or, on the other hand, the contrary condition of degenerating glands and a lessening of the HCl and ferments, which would call for a more stimulating diet and a more decidedly tonic medication, including the mineral acids, pepsin, antiseptics, and astringents. Besides, while in acid gastric catarrh abdominal massage would be contra-indicated except in the form of the lightest and most superficial rubbing (*effleurage*), in chronic asthenic

catarrh of the stomach energetic kneading (petrissage) of the whole epigastric region is very beneficial and often a curative agent of the utmost value.

The sample of stomach contents brought up an hour after the Ewald test breakfast will show you at a glance whether the meal has been properly digested into a uniform thin fluid, as well as give you a rough idea of the amount of mucus in the organ and its probable source, and will enable you to ascertain by chemical tests the total acidity, the proportions of free and combined HCl, the presence or absence of lactic acid, the amount and activity of the pepsin and rennet ferment present, and the extent to which the starch has been converted by the salivary ferment. By a microscopic examination you would learn the degree of microbic infection, and something as to the condition of the epithelium.

All this and more you can do if you wish to be very thorough, but if you will merely determine, by the simple tests already described, the total acidity and the amount of free HCl, if any, you will be able to decide whether in case of a great abundance of mucus you are dealing with an acid or asthenic catarrh of the stomach with a deficiency of the acid gastric juice. With a percentage of free HCl of .060 to .100 or more, and much mucus which you are able to satisfy yourself beyond reasonable question is of gastric origin, you should infer an acid gastritis. If the free HCl is constantly below .040 under the same conditions, the catarrh would be of the asthenic type. If the percentage were between these figures the form of gastritis would have to be determined by the microscopic findings or the later developments of the case. In case free HCl should be absent, you should test for lactic acid, which if present in decided amount even after a Boas oatmeal, milk-free test breakfast, would awaken a suspicion of cancer. If there is an entire absence of mucus in the sample of contents brought up, and especially if none appears in the wash water during lavage when the stomach is empty of food, there is not likely to be any inflammation of the gastric

mucous membrane (though it might be in the terminal stage of atrophy), and any aberration from the normal in the amount of the HCl and ferments could then be attributed to nervous causes; but in the case of the almost entire absence of all the elements of the gastric juice, including the rennet ferment with a total acidity of not over 10 or 12, you would consider the possibility of gastric atrophy, especially if the patient were very anæmic and emaciated, and cancer could be excluded. You will notice that I use here the word *possibility*, not *probability*; for experience has taught me that many cases may have practically no gastric juice for many months and yet, under proper treatment, later show a return of it.

But in case you find in the sample of stomach contents a moderate amount only of mucus, and you do not obtain any fragments which under the microscope reveal diseased epithelium, the question is not yet settled. You will then need to proceed to wash out the stomach, following the methods described in Lecture XXIX. If then, after cleansing away all remains of food and any coarse lumps of mucus found which will have usually been swallowed, you bring up more which is thinner, paler, and in fine flakes or delicate strings, you may decide, according to Riegel and others, that it comes from the gastric mucous membrane and, therefore, signifies chronic catarrh of the stomach.

According to my own experience, however, this may indicate only a transient catarrhal process, involving some one or more portions of the gastric membrane and capable under treatment of complete cure within a few days, just as often happens with slight catarrhal attacks in the nose and throat. My reason for this opinion is that I have frequently seen such mucus at the first lavage, which after washing out three or four times disappeared entirely, so that subsequent washings brought up no mucus at all. A diagnosis of chronic gastric catarrh cannot, therefore, be positively based upon even the symptoms and macroscopic findings in the wash water combined until after at least three or four washings, unless the

symptoms are very pronounced, as in serious cases, or the amount of mucus is very large. Fragments which under the microscope may show the condition of the epithelium are more likely to be found in the wash water after lavage than in portions of the stomach contents after test meals. But this, too, is a somewhat uncertain dependence, and negative results, such as finding pieces of glandular tissue showing normal cells, or the failure to find degenerated cylindric cells from the gastric mucosa at one or two examinations, is no proof of the integrity of the entire membrane. In deciding between a mild gastritis and nervous dyspepsia, you should remember that in the latter affection the symptoms are usually changeable and subject to remissions, while even in the mildest gastritis they are likely to be more constant.

The prognosis, like that of the acid form, is good or bad according to the stage and grade of the affection as well as the age of the patient, and according to the ability and willingness of the latter to make sacrifices and patiently carry out a somewhat troublesome treatment. Those who desire to be cured without help from a tube, and especially without much change from the habits of eating, drinking, and exercising, or more often, not exercising, which brought the disease upon them, may be safely promised that they will keep their gastric catarrh to the end of their lives, which will generally be considerably shortened thereby. Cases in which the glandular structures have not been much damaged, and in not too old or debilitated persons, can usually be cured in a few months, when the proper treatment is faithfully and persistently carried out.

In the milder cases which are not distinguishable from simple lack of HCl (hypochlorhydria of assumed nervous origin), recovery should always take place, when the patients can be fully controlled in all their habits.

LECTURE XLVIII

THE TREATMENT OF CHRONIC ASTHENIC GASTRITIS (CHRONIC GASTRIC CATARRH)

The Treatment: Dietetic and Hygienic.—As in chronic acid gastritis, so in the more familiar form of chronic gastric catarrh with depression of the glandular function, you will need to guard the patient always against foods and drinks of a decidedly irritating character, as well as the more fermentable ones, which tend to aggravate. In the asthenic form, however, the necessity of keeping to the blandest articles is very much less. The milder condiments can sometimes be taken with advantage, since they stimulate the appetite, and at first increase motility somewhat. Small doses of the sour wines may be well borne in a certain proportion of cases; and strictly limited doses of a good malt preparation, such as Hoff's Malt Extract, not exceeding two ounces, taken with meals containing much starch food, will usually prove safe and often helpful. But a free use of any of these things will surely be injurious.

In no disease is it more emphatically true that the patient, not the disease, needs to be treated. In arranging the diet of patients with catarrh of the stomach, hard-and-fast rules can rarely be applied with safety. Each case by itself needs to be closely watched and the secretions and excretions, especially the gastric juice and urine, should be carefully studied. If you attempt to follow in all your cases the hobbyists who advise an exclusive milk diet, the use of meat and hot water only, or a reliance on cereals, vegetables, fruits, nuts, etc., (the so-

called natural diet), you will very frequently be disappointed, particularly with the last-mentioned group of foods.

There are comparatively few positive indications and contra-indications. The *articles that most frequently disagree* markedly are those containing cane sugar, all forms of fresh yeast bread, rolls, etc., and the ordinary beers and malt liquors generally in the amounts usually taken, because of their proneness to rapid fermentation. Vinegar, pickles, cabbage, green corn, beans, shellfish, fried things, and all very coarse, tough, or hard substances which cannot be finely divided by the teeth and well masticated, are, as a rule, unsuited to these cases. Very much will depend upon the stage of the disease, the state of the nerve centers, and the strength of the muscular system; also upon the other treatment. For example, when a patient can spend some hours daily in rowing, pulley exercises, or other gymnastics for the trunk muscles, horseback riding, walking, or bicycling, and have in addition sponge baths and lavage as well as abdominal massage, a very much more liberal variety of diet can be allowed than would be practicable if there should be so little vigor of the muscles, nerves, and circulation as to compel the adoption for a time of the rest treatment.

Generally, I enjoin the avoidance of all the objectionable articles above mentioned, as well as, in bad cases, most of the vegetables, except in the purée form; but I have seen exceptional cases in which there was a very feeble heart, marked malnutrition on account of associated intestinal catarrh, and an intolerance of the stomach tube, so that the usual course of treatment had to be departed from in various ways. Both lavage and the customary restrictions in the diet, including a denial of sweets, were here followed by increased emaciation and debility. Therefore, the most nutritious foods were selected, and, besides much milk, cream, eggs, meat juice, chopped beef, purées and the finer cereals, some sugar even had to be allowed in order to maintain nutrition, while massage and the Nauheim resisted movements, with some cautious

medication, were relied upon mainly in the way of treatment, and with ultimate success.

In general the best course as to diet is to nourish as fully as possible without risking excessive fermentation and without irritating or overburdening the digestive organs, bearing in mind that a part of the food is lost through the fermentative and putrefactive processes in these cases.

Three to five moderate or small meals a day are best in most cases, especially when the motility of the stomach is weak. Exceptionally two meals are better. They should be eaten when the patient is free from worry and fatigue, and in as cheerful company as possible. Above all, it is necessary that plenty of time should be taken for meals, the food being most thoroughly masticated and insalivated.

Beverages.—As to the kind and quantity of liquid to be taken at meals, no inflexible rule can be made. Strong coffee and tea are drugs rather than foods, and are likely to do harm, at least in the end, though they are sometimes tolerated well for a time; and well-roasted coffee has been proved to exert some antiseptic action. Chocolate is often even more indigestible. The lighter forms of cocoa, especially an infusion of cocoa shells, more frequently agree. Cereal coffees, with good cream or milk, suit well in most cases, and a mixture of milk and hot water flavored to the taste may generally be permitted. Claret and water or other light wine may prove safe, and even useful, when there is no lithæmia or very high acidity in the urine. The amount of any fluid taken with the meal must be strictly limited, especially when the stomach is dilated or has weak expulsive power. More than half a pint is not usually desirable.

The general hygienic requirements are in the main those which every delicate person should observe. Indispensable are an abundance of pure outdoor air and sunshine. Therefore the seashore, mountains, or country will be the best place of residence—much better than any crowded city. Fatiguing indoor or sedentary occupations and excess of every kind

should be avoided and there should be plenty of sleep in large, well-ventilated rooms. Exercise out of doors is really essential to a cure, and must be taken by all except in the weakest cases.

Mechanical Forms of Treatment.—*Lavage* is probably the most useful of all the curative measures. When the amount of mucus and germ infection is great, it should be done every day (Riegel says twice a day), preferably in the morning before breakfast. Plain, sterilized warm water will often answer well enough, but the addition of table salt, two teaspoonfuls to the quart, will render it more efficacious. Drinking a pint or more of warm water, followed by vigorous contractions of the diaphragm and abdominal muscles, with the patient in different postures as hitherto described, so as to detach adherent mucus from the walls of the stomach, is a most helpful preliminary to the washing-out process. After passing one or two quarts of salt solution into and out of the stomach, a solution of resorcin or of alum, half a teaspoonful to the quart, or of nitrate of silver, 3 or 4 grains to the pint, may be introduced and quickly withdrawn in the more stubborn cases with advantage. Any remains of the silver nitrate should be removed by washing out further with plain warm water, which is better than a solution of common salt, to prevent any possible danger. Dilute HCl, a dram or dram and a half to the quart, has worked well in some cases. A large number of other astringent and antiseptic drugs has been recommended for use in the same way, and one will sometimes succeed when another has failed. A safe rule will be to employ as a maximum amount at one time not more than ten times the usual medicinal dose of the drug, since one-tenth part of the solution used may possibly be absorbed; dissolve this in at least a pint, and better, a quart or more of water, and then remove it promptly and completely. But it will be best to begin always with a much weaker solution.

Stomach washing should not be done too often (rarely oftener than once a day) or persevered with too long. As

soon as the mucus lessens markedly, it can be limited to thrice or even twice a week, and when none at all is found, it is better to repeat it once a week for a few weeks longer. Even if mucus is found which has come from the nasopharynx or esophagus, as often happens, it will be desirable to cleanse it away once or twice a week until the local catarrhal process above can be cured, since otherwise its presence facilitates the rapid multiplication of bacteria in the stomach, and thus keeps this organ infected, besides doubtless favoring the development of catarrhal inflammation in it.

Washing the Stomach Downward.—In the comparatively rare cases in which lavage cannot be practiced, something in the way of cleansing the stomach can be accomplished by having the patient drink two glasses of hot water several times a day an hour before meals with the view of washing the mucus downward. This cannot be safely done, however, in dilatation or marked motor insufficiency of the stomach, since in such cases the viscus does not readily empty itself and the increased contents would only further embarrass it. In the majority of cases of chronic gastric catarrh with a deficiency of HCl, the motor power of the organ is not much impaired, at least in the earlier stages; but at the best the warm water drinking is much less efficient than lavage, since it only carries the mucus and its contained bacteria on into the intestines, from which they are by no means always promptly expelled.

In Germany the saline waters of Homburg, Kissingen, and Wiesbaden, especially, are used in a similar way; but my observations while at Homburg recently did not impress me very favorably with the value of the routine use of that water in gastric catarrh. The imported Kissengen water, however, I found useful in this disease, especially in constipated cases. Professor von Noorden has recently borne strong testimony to the value of these saline waters in the different forms of gastric catarrh.¹

¹ "Saline Therapy," New York, E. B. Treat & Co., 1904.

The addition of salt or of salt and soda together to warm water taken internally often effects good results, but a free use of these remedies internally would not be nearly as safe as lavage.

Modes of Stimulating the Gastric Muscles.—In connection with diet and lavage, skilled *massage* of the abdomen is as potent for good in this form of gastritis as it is for harm in the acid form and in simple hyperchlorhydria. One of the many good results of massage of this region is a strengthening of the abdominal muscles as well as the muscular walls of its contained organs. The glandular function can also be powerfully stimulated thereby.

These objects can also be promoted by various *special exercises* and forms of *gymnastics*. Rowing is one of the best of these, and an excellent substitute is the use of pulleys, especially those made with elastic rubber cords, which afford a yielding resistance. There are also numerous bendings and twistings of the body which do not require apparatus of any kind, and yet are very useful in developing the trunk muscles and the muscular walls of the abdominal viscera. They are described and pictured in works on physical culture and a number of them are described in Lecture XXIII. Most outdoor sports, especially golf and tennis, are helpful in the same direction, and it should be borne in mind that in proportion as the muscles—especially those of the abdomen—are developed, all the atonic forms of indigestion, including gastric catarrh, become milder and more manageable, provided always a proper diet and other hygienic requirements are observed.

Electricity is less useful in this disease than in acid gastritis, but when asthenic catarrh of the stomach is complicated with dilatation, as in many of the severer cases, intragastric faradization with the ordinary current from a coarse coil and with slow interruptions can do great good. Combined with very careful diet helped out by rectal feeding, and with regular lavage and massage, I have seen it rescue cases from the brink

of the grave. This procedure is fully discussed in Lecture XXX. on Intragastric Electricity, and an illustration is there given of the intragastric electrode as modified by myself.

Medicinal Treatment.—Drugs internally are much less useful here than the agencies already described. Laxatives need sometimes to be prescribed, though the hygienic measures and mechanical forms of treatment described in Lecture LXX. will often overcome the constipation. It is indispensable that there should be regular and complete evacuations of the bowels. HCl and pepsin in moderate, or sometimes even large, doses are usually important adjuvants in not too advanced cases, and may be of marked palliative value, even in the stage of atrophy. The manner of using these is fully explained in Lecture XXXI. Nitrate of silver, $\frac{1}{4}$ grain, combined with 5- to 10-grain doses of bismuth, may occasionally do good, and, when the patient has to forego the advantages of lavage, a little help toward lessening the fermentation can often be obtained from antiseptic drugs, of which one of the most efficient and least hurtful, if not pushed too long, is carbolic acid in 1- to 2-minim doses after meals, given with glycerin and guarded with spirits of chloroform, compound tincture of cardamom, and peppermint to disguise its taste and smell.

Resorcin in 2- to 5-grain doses and sulpho-carbolate of zinc in the same, or larger ones, have been much vaunted and will sometimes lessen the fermentation, but in my experience they have frequently been disappointing.

The nausea is best controlled by diet and lavage, but when the latter is impracticable, minute doses of calomel and ipecac will often afford relief. Bismuth and carbolic acid, well flavored in a mixture as follows, have served me well in such cases:

℞	Bism. subnit.	3 i
	Glycerit ac. carbol.	f 3 ss
	Sps. chloroform	} aa. f 3 iss
	Tr. cardam. com.	
	Aq. menth. pip., q. s. ad.	f 3 ii
	M. Sig. Teaspoonful in water or limewater every	
	two hours till relieved.	

The failure of appetite is usually best overcome by lavage and the administration of pepsin and HCl, but in stubborn cases may sometimes be helped by tincture of *nux vomica*, *gentian*, *quassia*, or *columbo*, and the Germans recommend very strongly *condurango*. I have recently seen the appetite and digestion both improved by 5-grain doses of *orexin tannate*, taken an hour before meals. This remedy seems to increase the secretion of HCl.

To sum up: By far the most effective single method of treatment is lavage, which the majority of patients soon learn to tolerate without inconvenience, unless there coexists serious disease of the heart or blood-vessels. There are a few other contra-indications which have been detailed elsewhere. Next comes diet. Third in the order of efficacy may be placed the copious drinking of hot water to wash the mucus downward, when the motor power of the stomach is good enough to render this safe. In the cases complicated with much motor insufficiency and still more with pronounced dilatation, intragastric faradization must take the third place, and sometimes, indeed, it can accomplish even more than lavage, though both are here often indispensable. Massage and special gymnastics should rank at least as high as fourth in curative power, and drugs internally administered are least effective of all, except to combat special symptoms.

Naturally, the combination of all the more valuable agencies, including especially lavage, diet, massage and gymnastics, offers the most promise of speedy cure, and spending several hours daily in the open air and sunshine in some healthful climate must in all cases contribute largely to effect that result.

LECTURE XLIX

CHRONIC STHENIC GASTRITIS (ACID GASTRIC CATARRH)

It may be considered as now established that there are at least two widely different types of chronic gastritis—the sthenic and the asthenic—those with an excessive secretion of HCl, and usually of the digestive ferments, and those with a deficiency or absence of the same. Further subdivisions have been made; and, in particular, there have been described a mucous, a hypertrophic, and an atrophic glandular gastritis; but the last-named is present in the terminal stage of most at least of the asthenic forms and exceptionally may occur at the end of the sthenic ones.

Chronic sthenic gastritis—acid gastric catarrh—has often been described among the gastric neuroses, the accompanying inflammatory condition having been overlooked; but there is nothing neurosal about it except, possibly, its origin in a certain proportion of cases, and its injurious effects upon the nervous system. Once established, it is one of the most constant, persistent, and even stubborn of gastric diseases. It affects chiefly persons of a nervous temperament, and the original nervousness of its victims is aggravated by the damaging effect which the excessively acid chyme has upon intestinal digestion, the gastric and intestinal mucous membrane, and the peristalsis.

As to its *etiology*, the neuropathic constitution seems to be a decidedly predisposing factor, and since it occurs far more frequently among brain-workers than among those who work mainly with their muscles, there is probably ground for the opinion of Mathieu, and other French authors, that intellectual

overwork may be one cause. Mathieu advises sexual rest in the treatment of the affection, and would therefore doubtless include excesses in venery among the predisposing causes. However this may be, it is suggestive that of the large number of cases of acid gastric catarrh that have been studied by me, the great majority have been in the persons of respectable widows, maiden ladies, continent widowers and bachelors, and married men of advanced years, in whom sexual desire has possibly outlived potency. Sexual erethism, then, has seemed a markedly predisposing condition. In the minority of cases there was usually a history of excessive mental or nervous strain, with irregular and rapid eating. It is probable, too, that the prevalent use of very highly seasoned foods and stimulating drinks, especially the sharper spices and condiments, as well as strong coffee and tea, by persons in whom the gastric secretion is always abundant enough without such irritants and in whom the nervous supply of the glandular apparatus, as well as the nervous system generally, is excessively sensitive and hyperexcitable, must conduce to the overaction of the gastric glands, and finally to proliferation of them.

There are also certain reflex causes of excessive secretion of HCl and indirectly probably also of acid gastritis. The one most frequently observed by me is movable kidney, and I have also seen cases in which the percentage of HCl fell to less than normal after a gastropexy had been overcome by strapping with adhesive plaster. Numerous observers testify to the influence of gall stones and renal calculi in producing hyperchlorhydria. Some of the gynecologists include endometritis, and the oculists eye-strain among the possible causes. Reasoning by analogy, I should think that any of these last might reflexly excite an excessive secretion of HCl, but do not believe they are so efficient in that direction as those affections previously mentioned.

Pathology.—In Lecture XLVII., on Chronic Asthenic Gastritis, I have discussed to some extent the pathology of the proliferative or sthenic form of chronic gastritis as well as that of

the ordinary gastric catarrh with an atrophic tendency. It would certainly seem to have a sufficient anatomic basis to warrant its separate consideration. Professor George Hayem of Paris, who has investigated the subject of the inflammations of the gastric mucosa more exhaustively than any other man, had this to say about the form now under discussion in a communication which he sent me for publication as part of a symposium on Hyperchlorhydria which appeared in the *International Medical Magazine* for June, 1903:

“The only glandular modifications the relations of which with hyperchlorhydria are well demonstrated are of an irritative variety. They are the kind we find in the different forms of parenchymatous gastritis which I have described. This form of gastritis, which is a fairly common condition, is either pure or mixed; and it is either irritative or both irritative and degenerative. The pure unmixed is the rarer. It is characterized by a general hypertrophy of the mucosa and by an active proliferation of the glandular elements. The excess of secretion usually accompanying this variety of gastritis is manifestly the consequence of the richness of the mucosa in glandular elements. In the advanced phases of this form of gastritis and in mixed gastritis with atrophy, the gastric juice becomes less and less abundant as the glandular atrophy progresses. The special changes in the glands that persist explain why there may still exist a marked degree of hyperchlorhydria with deficient secretion. Contrary to current views the excessive liberation of HCl during the course of digestion is not due to the multiplication of border cells; pathologic anatomy tends rather to show that these chemical changes are connected with proliferation of the principal cells.”

The symptoms alone will not enable you to make the diagnosis of sthenic gastritis. An analysis of the stomach contents after a test meal is always necessary before a positive decision can be reached. In the earlier stages, and even in fully developed cases, there are often no symptoms except those referred to the intestines or to the nervous system. Prominent

among the latter is a disturbance of sleep which may amount to obstinate insomnia or, as is more common, only to an uneasy, restless sleep, with the habit of awakening entirely at a very early hour of the morning. A majority of patients who, while blessed with a sharp appetite and a craving for meats especially, are irritable and excitable and unable to sleep after four or five o'clock A. M., will be found to be suffering from hyperchlorhydria, with or without gastritis of the proliferative type. When the sleep is promptly helped by a teaspoonful dose of bicarbonate of soda taken at bedtime, it may be set down as reasonably certain that the cause of the trouble is hyperacidity of some kind, and frequently it is the form under consideration.

There is nearly always a high degree of nervous erethism, with at first much mental activity; but later there may be depression; also intestinal flatulence and often gastric flatus as well, and either constipation or diarrhea—generally at first constipation and later sometimes diarrhea alternating with constipation, though exceptionally the bowels may continue to act normally, even in an advanced stage of the disease. The appetite is usually good and is often excessive, though it may be deficient. Emaciation and pallor indicating anæmia and failing nutrition always develop at some stage of the marked cases that are not arrested early. In a considerable proportion of the bad cases there is a more or less severe burning pain, especially at the height of digestion, though it may come on at any time during the digestive period and last till the stomach empties itself either by vomiting or propulsion into the duodenum, unless relieved by alkalies or anodynes. In both simple hyperchlorhydria and acid catarrh which persist for a length of time, chlorosis is more likely to develop than when the gastric secretion is normal (Riegel, Cantu, Bouveret, Hemmeter).

Spasm of the pylorus frequently results from the irritant action of the excessively acid gastric contents, with stagnation and retention of food, and secondary dilatation of the stomach,

just as it occurs in obstructive stenosis of the gastric outlet. Before its walls have weakened, there may be violent and excessively painful cramps of the stomach from the same cause.

Since salivary digestion is arrested very early in the stomach in this disease, there is likely to be a large amount of fermentation of the starchy foods. In decided cases this takes place not only in the stomach, but also in the small intestine, since the gastric contents continue acid after passing through the

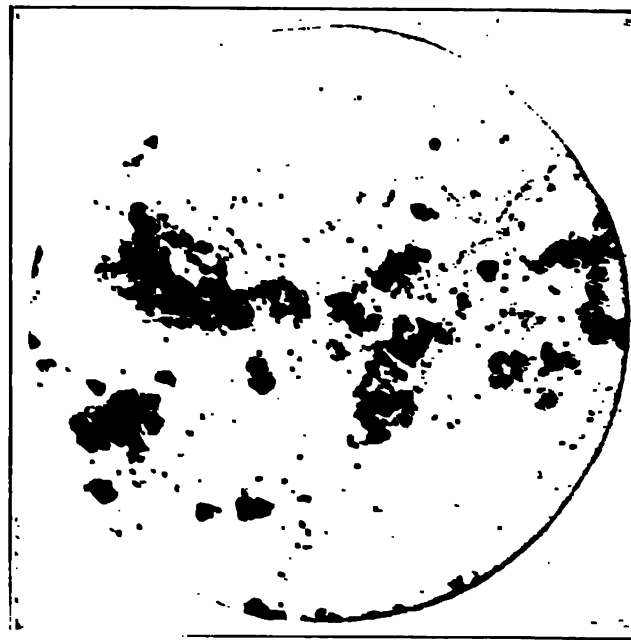


FIG. 66. Coliforma cells and yeast fungi found in the wash water from a case of chronic acid gastritis.

pylorus and thus inhibit the action of the pancreatic and intestinal juices, which require an alkaline, neutral, or at least a merely slightly acid medium.

The yeast fungi seem to thrive in spite of the largest percentage of HCl ever found in the gastric juice, and in all the typical cases of severe gastritis that I have studied, the micro-

scope has revealed myriads of them in every slide prepared with a drop of the stomach contents, especially if obtained toward the end of the digestive period.

(See accompanying illustrations, Figs. 69 and 70, from a case under the care of the author.)

The diagnosis of acid gastric catarrh is established by finding upon repeated analyses of the gastric contents obtained an hour after the Ewald test breakfast, either a full normal amount or an excess of free HCl upwards of 0.70 to 0.1 or even 0.2 to

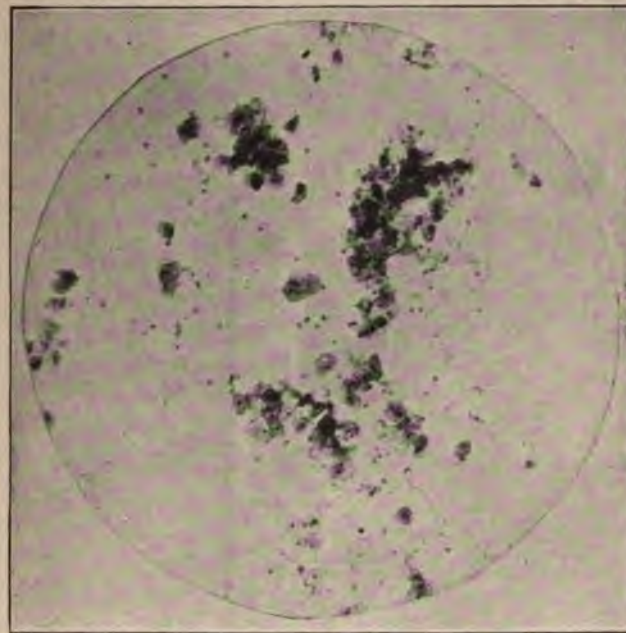


FIG. 70.—Yeast fungi and columnar epithelium from a case of acid gastritis.

0.3 per cent.—along with the usual signs of gastritis, including a considerable secretion of mucus from the stomach itself as shown by the microscopic examination. There may or not be also gastric ulcer present which, when it thus coexists, may probably be either a result or accidental complication, though according to the opinions recently expressed by Ewald and

others, it is often the cause of the hyperchlorhydria. Even a moderate percentage of free HCl—0.05 to 0.1—if persistent and associated with a profuse secretion of mucus in the stomach, as well as the presence in the wash water of degenerated cylindric cells, and with the symptoms above described, would warrant the diagnosis of chronic acid gastritis, since in the other forms of gastric catarrh the proportion of free HCl is always much below the normal.

What constitutes a normal HCl secretion is a mooted question, and I find myself differing from the opinions of many other gastrologists in this particular. It may be as well to give here as anywhere else my reasons for believing that the figures above mentioned are substantially correct, notwithstanding the fact that a considerably higher maximum for the normal range is generally accepted:

1. It is well known that intestinal digestion progresses best in an alkaline, neutral, or only slightly acid medium, and also that when any surplus of uncombined gastric juice meets the alkaline pancreatic and intestinal juices and the bile in the duodenum, the former is simply neutralized and destroyed by the latter fluids with a corresponding loss in their activity. Therefore, since Nature is not wont to provide under normal conditions for such wastefulness, it might well be assumed *a priori* that it is not normal for any considerable excess of HCl, pepsin, etc., to be left over at the end of gastric digestion to pass on into the duodenum and derange digestion there.

2. Observation of many hundreds of cases in my practice fully confirms *a posteriori* the foregoing *a priori* considerations. The most marked symptoms of an excessive secretion of HCl, according to the authorities, are a burning pain or at least a discomfort in the stomach toward the height of digestion, constipation and disturbed sleep—insomnia—this last symptom having been frequently noted and emphasized especially by me. Now it is an almost uniform experience with me to see patients suffering with some one or all of these symptoms while the percentage of HCl in their gastric juice is between 0.070

and 0.100, corresponding to the titration figures 20 to 30, and then, upon reducing these by medication or otherwise to the minimum above mentioned, the symptoms almost invariably disappear. The majority of patients having more than 0.070 per cent. of HCl have complained of one or more of the above symptoms and among those having 0.100 per cent. or a greater percentage of HCl, it has been quite exceptional not to find all three symptoms present. These reasons would seem to prove beyond question that the figures generally stated as representing the normal maximum proportion of HCl are altogether too high.

The Diagnosis from Ulcer.—The diagnosis of sthenic gastritis in its simple form from the same complicated with round ulcer is not always possible, since the latter may exist without its usual typical symptoms. In the latter case, however, you would generally find a markedly abnormal sensitiveness to pressure somewhere over that portion of the stomach which extends below the ribs, most frequently in the middle line and near the sternum, as well as over a small spot to the left of the spine near the origin of the eleventh or twelfth rib. There should be signs at times also of gastric hemorrhage (blood in vomit or stools) and the symptom of pain aggravated always by food, especially when in a solid form and still more if very coarse; but these may be wanting.

In uncomplicated acid gastric catarrh, without ulcer, vomiting is not common except in the worst cases, and there is never hematemesis; the pain is generally relieved by taking bland forms of albuminous food, such as milk or soft-boiled eggs, and often also by the ingestion of meat or even bread, while no foods afford any relief to the pains of ulcers, and the coarser aliments nearly always aggravate such pains at once. Furthermore, the pain of acid gastric catarrh may be almost certainly and immediately relieved by full doses of alkalies, but not so, as a rule, that of gastric ulcer, whether accompanied or not by acid gastritis, at least not at once and rarely ever so completely.

It would be a great achievement if, by means of ever so elaborate urinary analyses, we could certainly determine whether the stomach glands were secreting a normal proportion of HCl, or whether any departure from the normal in this respect was in the direction of excess or deficiency. Many able men have experimented in this field and Boas, in his "Magenkrankheiten," has discussed the results somewhat fully. These have not been very satisfactory. I have made a number of experiments in the same line, and my results were contradictory. It is possible, however, that eventually methods will be perfected by which approximately accurate conclusions as to the gastric secretion may be reached in this way. (See Lecture XI.)

Microscopic Help.—Repeated analyses of the gastric contents in connection with the symptoms will be sufficiently diagnostic, as a rule; but you may often find in the wash water after lavage, fragments of the mucous membrane in which the microscope will reveal proliferation of the border and chief cells especially. In the older cases, many of the cells may be seen to have undergone granular and mucoid degeneration and vacuolation (Van Valzah and Nisbet). So much importance is placed upon the microscopic demonstration of these cases by Hemmeter that he advises snipping off a piece of the gastric mucous membrane by an instrument devised for the purpose, when a suitable specimen cannot otherwise be obtained.

LECTURE L

THE TREATMENT OF CHRONIC STHENIC GASTRITIS (ACID GASTRIC CATARRH) AND OF HYDROCHLORIC ACID EXCESS

IN its incipency acid gastric catarrh is curable enough when the patient can be fully controlled, including his diet. When there exists merely an excessive secretion of the gastric juice, with only a slight involvement of the secreting glands, a correction of the faulty hygiene upon which it depends, with, and sometimes even without, a neutralizing of the abnormal amount of HCl present in the stomach during digestion, by full doses of alkalies, will suffice to cure the affection completely and within a short time. Unfortunately, it is scarcely ever recognized in this stage, since it is so common to classify all the less severe gastric symptoms under the vague name of "dyspepsia" and dismiss such ailing patients with a routine prescription, given at a venture. But the longer this form of gastritis goes on, the more does the mucous membrane of the stomach become involved. When it is fully established and the cell-proliferation has extensively developed, it is rare that the affection can be thoroughly mastered under six months or a year, even with the most skillful treatment, and with the loyal and persevering co-operation of the patient. Later on, when, as almost inevitably happens, the intestines have become involved in a secondary catarrhal process and nutrition has begun to suffer severely, as shown by emaciation, anæmia, loss of strength and nerve tone, and deranged cardiac action with hepatic enlargement or contraction, insomnia, and often some consequent disease of the skin, the difficulties in the way of a cure are vastly increased and the result must be much more doubtful.

The prognosis, then of chronic acid or sthenic gastritis, it may be said, is good in the earlier stages, when the patient can afford, and is willing, to make the necessary sacrifices. If a brain-worker, he may have to abandon his business, or, at least, reduce the time devoted to it. He must certainly change his habits as to eating and drinking, and probably will have to reform unhygienic habits in other respects. Even advanced cases, with the help of such sacrifices and of the best possible treatment followed up for a long time, may be restored to fairly good health in the end, though there are few diseases that tax more severely the patience and ability of the physician.

The treatment of acid gastritis and HCl excess (hyperchlorhydria) is much the same; and when the former is mild or the latter is severe and stubborn, it must be identical. It presupposes, as an absolutely indispensable condition, a few laboratory appliances and the ability to make a number of the chemical analyses of the stomach contents that have been described in previous lectures.

As the diagnosis cannot be reached without the aid of the stomach tube and burette, so you will find it necessary to make the quantitative tests for free HCl and for the total acidity, at least, in order to manage a case of this disease with any hope of success. For the dose of alkali that fails utterly to lessen the percentage of acidity in one patient, proving possibly so small relatively as even to stimulate the glands to a still more excessive secretion, may within a few days change, in another patient, the excess of HCl into a deficiency. Not to be able to recognize this changed condition would risk injury to the more sensitive patients by continuing longer with unsuitable remedies.

By far the most important part of the treatment is the hygienic. You must, first of all, free the patient, so far as possible, from any existing mental overstrain, great worries, or sexual erethism. These are probably among the most prolific causes of hyperchlorhydria or excessive secretion of HCl

which, when long continued, doubtless usually results in chronic sthenic gastritis. According to my experience, when it is impossible to remove these disturbing influences, as unfortunately it often is, the patients do not get well.

Rapid and excessive eating and insufficient mastication of food are other prominent causes of the disease, and must be reformed altogether before there can be any possibility of a cure. Still other causes are movable kidney, and probably displacements of other viscera.

The diet is most important in these cases. Authorities differ widely, however, on this point. Probably a majority of them still recommend that patients be fed mainly on the albuminoid foods, including, especially, meat, eggs, and milk, for the reason that these neutralize a far larger proportion of the acid than do the starchy foods, and for the further reason that starch ordinarily is imperfectly digested in these cases, thus leading to injurious fermentation.

These would seem to be weighty reasons—and at first unanswerable ones—but my own experience soon taught me that on a meat diet hyperchlorhydric patients were prone to grow worse instead of better, and various other specialists in gastric diseases record similar observations. Pawlow, Hemmeter, and others have demonstrated that meat in animals is a powerful excitant to the gastric glands, largely increasing the secretion of HCl. These observed facts would not settle the matter if it were true that starchy food could not be made to digest in such persons. But here again experience is worth more than theory, and it has shown that the most excessive acid secretion does not preclude us from giving, with certain precautions, a due proportion of carbohydrates or starchy foods. A physiologic diet—one that will sustain nutrition unimpaired for long periods—must include a preponderance of the class of foods to which starch and sugar belong, though the hydrocarbons or fats will help to supply any deficiency of these. On meat, fish, and eggs, with even milk added, but without starch or sugar, an adult patient would ultimately suffer se-

rious impairment of health. There is some sugar in milk, but not enough to sustain nutrition perfectly.

You can overcome the difficulty by having the starch partly predigested or caused to undergo artificially some of the chemical changes that finally transform it into sugar. This is done by heat in making toast or zwieback, and may be greatly promoted and hastened in the stomach by administering with the starch some of the various diastasic preparations, including the one known as Taka Diastase, which is quite active. By giving moderate doses of calcined magnesia and bismuth, or of bicarbonate of soda, directly after eating (or in some instances before), the excessive acid can be neutralized, and thus the continuation of salivary digestion in the stomach be rendered possible.

In cases of hyperchlorhydria, then, whether or not there is an associated gastritis, your proper course will be to order as bland, non-stimulating, and easily digestible a diet as possible, at the same time taking care that it is one that will fully supply the needs of nutrition. You will best accomplish this in most cases by letting milk, when it agrees in other respects, form a large part of the aliment, adding to this eggs, gluten preparations, macaroni or spaghetti, and toast or zwieback, with also an abundance of butter or other fats, provided the intestinal digestion be not seriously impaired. The blander vegetables may also be added, especially in the form of purées, and baked or boiled and mashed white potatoes often agree fairly well, when eaten slowly in the early part of a meal. String beans, spinach, or squash may usually be safely allowed, but all the starchy foods need to be thoroughly well masticated and insalivated, and taken in the earlier part of a meal before the stomach contents have become excessively acid. Idiosyncrasy (which here means usually intestinal indigestion) may compel the omission, in certain cases, of various articles which agree perfectly in others apparently similar. Cane sugar is apt to increase fermentation, but may sometimes be well borne. Fish or meat may be safely allowed at one of the three daily meals

in all except the most stubborn cases, and may need to be taken at two of the meals by patients who are obliged to live in hotels or boarding houses. Without these foods patients so situated are often driven to desperate straits, since they can rarely obtain enough of other viands that are suited to them. Beef juice or scraped beef is much better for these patients than meat fiber, for the double reason that it digests much more rapidly and is less irritant to the inflamed mucosa and glands. Hashing the meat and removing the gristly portions is also advisable. All the more acid fruits should be forbidden, though the milder ones, such as baked sweet apples, white grapes and bananas, and, exceptionally, fully ripe peaches or pears, and very sweet oranges may be allowed *sparingly*.

The best beverages for such patients are water and milk, variously combined and flavored. They may be pleasantly warm at meal-time, but never hot enough to be decidedly stimulating. There is no objection to the infusions of burnt grains known as cereal coffees, except that the starch in them cannot be insalivated. They are nourishing and innocuous and many patients soon learn to like them almost as well as their accustomed infusions of the real stimulant beans. A large use of some non-stimulating fluid is helpful in diluting the excess of acid in these cases, both during and after meals, except when the motility of the stomach has become seriously impaired, and even when there has occurred some dilatation from pyloric spasm, a glass of plain water drunk every half hour during digestion will often do good, rather than harm, by lowering the acidity of the gastric contents to the non-irritating point. Observation in a large number of cases has led me recently to this view, which is contrary to that taught by some leading authors and formerly held by me.

Real coffee and also tea probably stimulate the gastric glands as a rule, though results of experiments are not in accord as to this, and, moreover, coffee and tea tend to increase the amount of the xanthin bases in the system, and many (perhaps I should say most) of these patients suffer from so-called

uricacidæmia. Chocolate is better, except when there is concomitant intestinal indigestion, and then it usually aggravates the latter condition.

The spirituous liquors, though not acid, stimulate the gastric glands in small doses, and act injuriously, when long continued in any dose, upon the liver which, in these cases, is damaged soon enough anyway by the auto-intoxication resulting especially from the intestinal complications.

The most important articles of diet contra-indicated and to be forbidden entirely are the sharper condiments, such as pepper, horse-radish, mustard, spices of all kinds, vinegar, garlic, onions, and the hot or stimulating sauces. An excessive amount of salt is also objectionable. Meat fiber, unless finely hashed, tends to overstimulate all the more decided cases of hyperchlorhydria, and should be much restricted at least. The vegetables, like peas, beans, and corn, except when prepared in purée form, contain much tough and irritating indigestible residue and do not suit such cases well. Coarse oatmeal with its sharp husks, and any of the cereals when only partly cooked, are likely to aggravate. These foods irritate because of their physical properties, and also because the starch cannot be well insalivated.

When one considers that in most American restaurants, hotels, and boarding-houses, as well as in the majority of private households, the soups are fiery hot, the steaks and chops prepared with butter and pepper, and the coarser cereals that are almost universally furnished, rarely more than half cooked, is it any wonder that an excessive secretion of HCl, with or without gastritis is the most prevalent form of dyspepsia in this country, and that it is, under ordinary conditions, very difficult to cure?

Patients thus afflicted should not do more than a very moderate amount of mental work, and, though they need to be as much as possible in the open air and sunshine, should not exercise even their muscles excessively—to the point of marked fatigue. They should be very moderate in sexual indulgence

and avoid entirely sexual excitement which remains ungratified. They should, above all else, have an abundance of sleep. Cold or tepid sponge baths (preferably with salt water), salt rubs, and various other tonic hydropathic procedures are helpful.

A very valuable and, in many cases, an indispensable means of combating the sthenic, as well as the asthenic, anacid, or atrophic, forms of chronic gastritis is lavage. In most of the advanced cases, and in all of those with dilatation and stagnation, which may result from spasmodic contraction of the pylorus in this disease, you will need to wash out the stomach every day, or, at the very least, every two days. Dissolve two teaspoonfuls of bicarbonate of soda in each quart of warm water, and have the lavage continued with this solution until the last comes away clean, without even small fragments of mucus. When the stomach is badly infected with yeast fungi, or other micro-organisms, I have found the solution of one-fourth to half a teaspoonful of alum, along with a teaspoonful of soda, in the last quart of water a helpful resource.

The lavage, as a rule, should be done in the morning, at least twenty to thirty minutes, if possible, before breakfast, though there is no objection to washing out later in the day, provided a time can be found when the stomach is practically empty, so as not to involve the harmfulness of removing digested nutriment almost ready for absorption.

A practical wrinkle which I have hit upon, and found very useful, is to precede the lavage proper by having the patient drink two or three glasses of the prepared solution (or if this has too bad a taste, of plain warm water), and then assume such different positions upon a couch or a carpeted floor as will bring the fluid into contact successively with every part of the stomach, meanwhile taking deep inspirations and forcibly contracting the abdominal muscles so as to make the contained water wash the walls of the stomach. For example, the patient should do this at first while lying on the back, then on either side, on the face, and, finally, in the knee-

chest position. These movements in such positions, kept up for three to five minutes in all, will enable the stomach to be washed out afterward completely in one-third the usual time.

Intragastric Electricity.—You need to be fully informed as to another most valuable measure, which is especially adapted to those serious cases of chronic sthenic gastritis which have resulted in, or become complicated by, dilatation of the stomach with delayed emptying of its contents and all the dismal train of troubles which follow. It is intragastric electricity—both galvanization and faradization. By means of my modification of the intragastric electrodes previously in use, an illustration of which is shown on p. 324, it is possible for any physician to treat in this way the most delicate patients, including some of those who cannot retain in position the ordinary stomach tube long enough to admit of a complete lavage. This is owing to the fact that the cord carrying the current is very small, perfectly insulated, and covered besides by thin rubber, while at the same time the lower end is so stiffened as to facilitate its introduction. The end-piece is also so improved in form as to be easily swallowed, and, what is equally important, may be withdrawn without difficulty. See cut No. 50, on p. 324, and also Lecture XXX. on Intragastric Electricity.)

To carry out this special treatment, connect one pole of a good, high-tension faradic battery (one of Kidder's latest has served me well) with a well-wetted pad, about 4x6 inches, which is to be placed over the epigastrium, or dorsal spine, against the bare skin. The patient then, while sitting, drinks a full goblet of water, swallows the intragastric electrode, and lies down on the back on a comfortable couch or gynecologic chair. The other pole of the battery is now connected with the cord attached to the electrode and the current turned on gradually. No unpleasant sensation should be experienced. For the cases with a large excess of HCl, the coil with the finest and longest wire (not less than 3000 feet of a No. 36 wire), should be used. A current as strong as can be borne easily may be

used for five to eight minutes on alternate days. The vibrator or interrupter, too, should work smoothly, and be capable of such rapid interruptions as to produce a uniform musical sound. Such treatments are often rapidly effective, not only in lessening the excessive secretion, but also in curing the catarrhal process and strengthening and contracting the dilated stomach, but should not, as a rule, be persevered with for more than a month at a time without intermitting them for a week or two. My later experience proves that a mild current will often accomplish better results than stronger ones in these cases.

Other Methods of Applying Electricity.—The galvanic current used in the same way, with the positive pole inside, is sometimes more effective in controlling gastric pain. The ordinary faradic coils, with short, coarse wires, are more stimulating and suit better in deficient secretion. When for any reason electricity cannot be applied directly to the inside of the stomach, by the method just described, something may be accomplished by external applications of the same. Despite claims to the contrary, my belief is that strong currents can be made to penetrate the abdominal walls sufficiently to enable both the muscular and glandular structures of the stomach to be affected favorably, though probably in only slight degree directly. At all events, with a large pad over the epigastric region, and a small electrode moved slowly upward and downward over the spine, the nerve centers and nerves supplying the digestive organs can be influenced in a helpful way. I generally use 3 to 10 ma. of galvanism in this way, with positive to the spine; or 20 to 30 ma. may be applied through the stomach from side to side. With the positive pole in the form of a very small electrode, 1 to 3 ma. may also be passed through the pneumogastric nerves on the sides of the neck (under the edge of the sternocleido-mastoid muscle) with good results in most of these cases. The negative pole should be over the epigastric region as before. The séances should be from five to eight minutes every other day, or even every day at first. Only the

very small doses mentioned are helpful when thus applied to the neck.

General massage, avoiding the abdominal region, except for the lightest surface rubbing, is an adjuvant of value, especially in the worst cases in which active exercise is not practicable.

The Medicinal Treatment.—The use of drugs in this disease requires much care and discretion. The patients are usually the better for nerve tonics, if given through any other avenue than the stomach, and will often require temporarily anti-spasmodics or even sedatives and analgesics. But alkalies must play the largest rôle in the medicinal treatment. Calcined magnesia has far greater acid-neutralizing power than soda and most other alkaline drugs, and is the preferable remedy, especially when, as usual, there is associated constipation. The dose required to neutralize the excess of acid, and gradually to lessen its secretion may be anywhere from 10 to 30 grains (or even more) three times a day, an hour after meals. In very severe cases it is best to give a dose of alkali, also just before the meals, so as to prevent interference with starch digestion.

When the larger amounts of magnesia are required, and in other cases when there is no constipation, it is necessary to combine 5 to 10 grains of bismuth with each dose. It is then, too, often advisable to replace a part of the magnesia by a portion of prepared chalk, which is also an effective alkali. The following is a good combination for such cases:

R Magnesiæ ustæ..... 3 i—3 iv
 Cretæ preparatæ..... 3 ss—3 ii
 Bism. subnitrat..... 3 i—3 ii
 M. et. ft. Chart No. XII.
 Sig.: One mixed with a wineglassful of milk or
 water an hour after each meal.

In particularly stubborn cases (and plenty of such will be met with), the addition to the above prescription of 1 to 2 grains of pulverized extract of belladonna, or 1-20 grain of atropine, will render it more effective, though in that case, as

these drugs powerfully lessen the secretion of the saliva as well as of the gastric juice, it will be well to administer with each meal a dose of some good preparation of diastase. Atropine usually succeeds better in simple hyperchlorhydria than in acid gastritis, and should never be pushed long.

The following prescription, recommended by Dr. Stockton of Buffalo, has been largely used for excessive HCl secretion by him, and by Dr. Allen A. Jones of the same city :

℞ Cerii oxalat..... 3 iv
 Bism. subcarb..... 3 viii
 Magnes. carb. levis... 3 ii
 M. Sig. One-fourth to a heaping teaspoonful in
 water two hours after each meal.

When the bowels are inclined to looseness, and the magnesia cannot be made to agree, the sodium bicarbonate may be used instead. But, in that event, do not make the mistake of administering it in too small doses, which would aggravate the disease. I have often seen even half-teaspoonful doses of soda followed at first by an increase of the hyperchlorhydria. In the severe cases it is safest to give the remedy in teaspoonful doses three times a day, and even then it may fail. I have seen some such combination of magnesia and bismuth as those above given succeed promptly, when soda in the fullest doses had only aggravated the excessive action of the gastric glands. There should be a quantitative test of the stomach contents at least every week, during any such course of treatment, to ascertain the result, and avoid going too far. These alkaline remedies may be repeated safely as often as may be necessary to control any existing burning pain, or discomfort due to the excessive HCl.

In cases in which the alkalies are not well borne, I have seen the following prescription occasionally succeed :

℞ Ext. belladonnæ..... gr. i—gr. ii
 Ext. yerbæ santæ..... 3 i
 M. et. ft. mass. in pil., No. XVI. dividend.
 Sig.: One after each meal.

In other stubborn cases in which alkalies do not act well, large doses of bismuth, such as are suitable for gastric ulcer, according to Fleiner's method, may effect good results. For example:

℞ Bismuthi subnit. 3 vi—3 i
 Ft. chart No. XII.
 Sig.: One mixed with milk or water half an hour before each meal.

Possibly in the exceptional cases, in which this prescription proves successful, there are latent ulcers which keep up the irritation of the glands.

Nitrate of silver in doses of 1-8 to 1-4 grain is sometimes a very useful remedy. It may be combined effectively as follows:

℞ Argent. nitrat. gr. ii—gr. iii
 Ext. bellad. gr. i
 Bism. subnit. 3 ii
 M. et. ft. mass. in capsulæ, No. XVI. dividend.
 Sig.: One after each meal.

This combination is adapted best to cases in which the bowels are too loose, or may be given additionally to correct the overlaxative effect of the treatment by magnesia.

In stubborn cases frequent changes of the remedy are necessary, since it is not usually safe to push either alkalies or belladonna preparations in full doses beyond a week or two at one time.

Another useful method of treating the disease under consideration is by spraying the inside of the stomach with a 0.1 to 0.2 per cent. solution of nitrate of silver, after first washing out the viscus.

In most cases of acid gastric catarrh, when the patient can rest, eat, and drink rationally, and reform all hygienic faults, it is not so difficult to remove all symptoms, to stop virtually entirely the excessive secretion of mucus, and to bring the HCl within normal limits, as it is to maintain this improved condition. The trouble is that the patient, while often rapidly re-

lieved of all that he complained of, will rarely continue treatment till the physician finds by his tests, chemical and microscopic, that the disease has been really cured. A low-grade inflammation of the gastric mucous membrane persists, and when treatment with the careful diet, and attention to hygienic requirements otherwise are abandoned, the symptoms soon return.

The only safe plan is to insist upon careful living, with some mild treatment, until the disease can be shown to be well; and, even then, to warn the patient that only by persevering with a reasonable amount of care can he continue well.

The Treatment of Hyperchlorhydria will be referred to again in Lecture LI., but differs in no wise from that described above, when it is severe, or inclines to be persistent, and, indeed, I believe with Hayem, that in such severe cases at least, there probably exists a real proliferation of the secreting structures. But in the milder cases, much less need be done than is required for well-marked sthenic gastritis. Complete rest of both mind and body, or at least a lessened demand upon the nervous energies in all ways, with a carefully regulated diet, suffices usually to effect a recovery in such cases within a few weeks. When these hygienic measures alone fail, toning up the nervous system by means of electricity, and hydriatic applications, with or without the administration of moderate doses of alkalies two hours after meals, and perhaps also a small dose of bromide of sodium combined with a little hyoscyamus or belladonna at bedtime, will nearly always promptly succeed.

LECTURE LI

EXCESSIVE SECRETION OF THE GASTRIC JUICE (HYPERCHLORHYDRIA, OR HYPERCHYLIA, GASTROXYNSIS, REICHMANN'S DISEASE, ETC.)

IN discussing chronic sthenic gastritis in Lectures XLIX. and L., I touched incidentally upon simple hyperchlorhydria, a condition which is supposed by most authorities to be neurosal merely. It is often impracticable for even an expert to diagnose between a case of marked hyperchlorhydria and incipient or mild acid gastritis, and the treatment of the two affections is the same precisely, except that lavage, which is probably indispensable in advanced cases of the inflammatory affection, is not necessary in the simple neurosis.

For the sake, however, of completeness in this series, and also because gastroxynsis and Reichmann's disease, which have not been hitherto considered by me, are somewhat important, I have decided to devote a brief separate lecture to this group of affections.

Keeping in mind the essentially practical character sought to be given to the instruction herein imparted, I shall avoid disputed questions and the citation of many authorities, even at the risk of being considered dogmatic; but anyone desirous of delving more deeply into these subjects will naturally obtain some one of the numerous complete treatises upon them now accessible, even in English.

It is my own opinion, based upon a considerable experience, that there rarely occurs a long continuance of an excessive secretion of the gastric juice from whatever cause, without exciting some proliferation of the secretory glands.

Symptomatology.—Simple hyperchlorhydria presents the symptoms already described under Chronic Sthenic Gastritis in Lecture XLIX. If they have not lasted long, it may be inferred that they probably arise in consequence of a reflex disturbance in some other part, such as a movable kidney, hepatic or renal calculus, or some disorder in the nervous or sexual system, and they are not necessarily a result of a sthenic or acid gastritis. If they have existed either per-

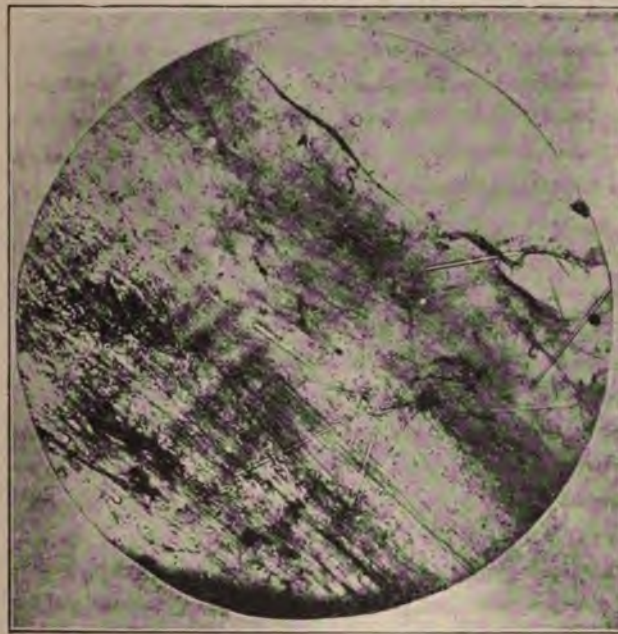


FIG. 71.—Magnesium phosphate-crystals from stomach contents in a case of hyperchlorhydria and neurasthenia. The same crystals were found in the urine.

sistently or intermittently for years, or even many months, there may well be a strong suspicion of cell proliferation, and it may then be expected that the disease will not yield easily or quickly. The excessive secretion then may be speedily lessened, often by full doses of the alkalies or belladonna, but soon returns after the remedy has been suspended.

You will see scores of cases in which hyperchlorhydria or an excessive secretion of HCl during digestion is a fairly constant condition, with or without acid gastric catarrh, for every case encountered of the other forms of hypersecretion above mentioned. In *gastroxynsis*, or *gastrosuccorrhea chronica periodica*, which is admitted by most observers to be rare, there are sudden and severe attacks of nausea, vomiting, and gastric pain, in which quantities of fluid mixed with mucus, and sometimes bile, are brought up, showing a large excess of HCl, and accompanied usually by headache, which may be intense, and by depression or prostration. The attacks come on suddenly, most frequently in the night, and last one or several days. They recur at varying intervals, sometimes as often as once a week, though rarely so often, and sometimes they are a year or more apart. Between them the patient may enjoy apparent health, though often a considerable excess of HCl will be found in the stomach during the digestive periods.

This disease affects especially brain workers and excitable persons, as do all the forms of hyperchlorhydric excess, and seems due often to excessive or prolonged mental strain.

The continuous hypersecretion or Reichmann's disease, often called also *gastrosuccorrhea chronica continua*, is exceedingly rare as a pure neurosis, most of the supposed cases probably being the result of an obstructed pylorus and gastric dilatation. The symptoms are those of hyperchlorhydria, except that they persist during the intervals between the digestive periods—that is, not only when there is food in the stomach, but also when there is not. Considerable fluid containing the elements of the gastric juice can be found in the stomach in the morning fasting, and not mixed with remains of food, even when the stomach has been washed out thoroughly the preceding evening. There is also more likely to be gastric pain and vomiting than in simple HCl excess. Marked nervousness, with usually constipation, and most commonly insomnia, are further symptoms of importance.

Differential Diagnosis of the Forms of Hypersecretion.—

This must turn almost entirely upon the chemical and microscopic examinations of the stomach contents. When an abnormally high percentage of HCl is present during digestion only, and, besides an absence of any considerable amount of mucus of gastric origin, there is an absence also of cell elements coming from the gastric mucous membrane and showing proliferation, the case is one of hyperchlorhydria, probably without any gastric catarrh. When there are the same findings at all times of the day, in the morning fasting as well as at other times, the trouble is most likely to be Reichmann's disease.

When the symptoms and signs of HCl excess come on periodically, and with violence, yielding to treatment in a day, or in two or three days, and leaving the patient between times either well or with only a moderate hyperchlorhydria, the trouble may be set down as gastroxynsis.

The *diagnosis from gastric ulcer* is not always easy. Indeed, it is rarely possible to exclude ulcer positively in any case of painful indigestion, especially with an excessive or normal percentage of HCl. But in most cases of ulcer there are markedly sensitive spots over the epigastric region—usually near the ensiform process—and very often at the left of the spine near the origin of the eleventh and twelfth ribs. Even moderate pressure upon these spots elicits decided pain. Then hemorrhage from the stomach, shown either by the vomiting of blood, or altered blood, or passing the same with the stools (coffee-ground vomit or stools), occurs in at least four-fifths of all cases of ulcer, and not in the uncomplicated forms of supersecretion. The pain is more severe, and longer lasting usually in ulcer, and is aggravated, almost never relieved, by food, especially by solid food.

Let me guard you against one mistake, which is often made by good clinicians, and by some even who consider themselves stomach specialists—that is, relying upon Congo red paper in testing for free HCl. Congo red is changed decidedly in color to a bluish tint by any kind of free acid, even by organic

acids, especially if present in considerable amount, though the change is to a more pronounced blue in the presence of free HCl. It is wholly unreliable except as an evidence that some form of free acid is in the stomach contents. There are other almost equally convenient tests for HCl, which are always reliable—especially the phloroglucinvanillin or Günzburg test.

The *Prognosis* is rather better in all of these forms of hypersecretion than in those complicated with a catarrhal process. Still the severer cases are always rather stubborn, and are very liable to relapse.

Treatment.—I can add very little to the measures previously advised for the major affection—acid gastric catarrh. In gastroxynsis no food should be given the first day, and after that, feeding should be resumed very cautiously and tentatively with spoonful doses of milk and limewater or beef juice, white of egg and such predigested aliments as Somatose powder with milk, or the Somatose biscuits, Bovinine (one or two teaspoonfuls in a wineglassful of milk or water), Plasmon, and Eskay's Food with milk. After a day or two of small feedings with one or more of these every two hours, the diet may be gradually enlarged to that prescribed in Lecture L. for chronic sthenic gastritis, which is the same as that suitable for simple hyperchlorhydria, as well as for Reichmann's disease.

During an attack of gastroxynsis the patient should be kept in bed, and a partial rest treatment (rarely complete and continuous rest, unless the patient be a hysterical woman) is often helpful during the first month or so of the management of other severe cases of hypersecretion. Rest on the back a part of every day, with massage, Swedish movements, and electricity, is often very advantageous, but a complete rest from mental occupation and from sexual excitement is still more important. Changes of climate and gentle, never excessive outdoor exercise are exceedingly useful.

In simple hyperchlorhydria and in gastroxynsis lavage and intragastric electricity are not often necessary, but in Reich-

mann's disease they may both prove very useful—indeed more so than anything else. (See Lecture L., on the Treatment of Chronic Sthenic Gastritis and HCl Excess.)

The medicinal remedies advised for acid gastric catarrh act equally well usually in the nervous forms of excessive secretion. In gastroxynsis, of course, they are applicable especially during the intervals between the attacks. In Reichmann's disease, it is important to push the treatment somewhat energetically, and atropine in fairly full doses often needs to be administered, but it should not be forgotten that when the remedy is carried to the point of drying the mouth, it is very desirable to give some active diastasic preparation with or near the meals—preferably the Taka Diastase. Nitrate of silver is another remedy which should be remembered, both for its tonic action on the central nervous system, and for its astringent, antiseptic, and locally sedative action on the gastric mucous membrane.

Alkalies and alkaline spring waters, especially Carlsbad and Bedford, can be employed helpfully, if carefully watched and stopped in time. Hyperacidity is not the same as hydrochloric acid excess. Before leaving this subject, I desire to impress upon you a few words of caution:

A relic of the old days, when all of us had to guess at the probable character of the contents of our patients' stomachs, is the ambiguous and very mischievous word hyperacidity. The term acid dyspepsia has also come down to us from the same hazy prescientific period. Some writers, unfortunately, still designate indigestion with HCl excess as acid dyspepsia, and refer to hyperchlorhydria as hyperacidity. This is a vagueness which has caused much very bad therapeutics.

An excess of organic acids, such as lactic, acetic, butyric, etc., often produces a marked and painful acidity of the stomach contents with very injurious results to the intestinal digestion as well as to the intestinal mucous membrane and the nervous system. Even spasm of the pylorus and dilatation may probably be results of this form of acidity. Such a hyper-

acidity is caused by an opposite condition to that found in hydrochloric acid excess—that is a condition of debility, or more or less complete atrophy of the gastric glands which results in a deficiency or even total absence of secretion of the gastric juice. To treat this markedly asthenic condition by alkalies and other remedies designed to diminish the activity of the glandular structures of the stomach would naturally lead in the end to a disastrous aggravation of the disease and all its symptoms; yet this is frequently done by men who do not analyze the gastric contents of their patients, on the supposition that the vomiting or gulping up of intensely sour ingesta signifies hyperacidity, or acid dyspepsia, and that this always demands an alkaline treatment.

In such cases, when the vomited ingesta are sour from an excess of organic acids with absence or a deficiency of HCl and pepsin, an exactly contrary line of treatment is usually required—to wit, the administration of these deficient elements of the gastric juice as medicines, together with roborant treatment generally.

LECTURE LII

ROUND ULCER OF THE STOMACH

ULCER of the stomach, called also round or peptic ulcer, is often latent, running its course either entirely without symptoms, or with only such as are ordinarily referred to dyspepsia. Pain, and the loss of blood, either by vomiting or by way of the bowels, though present in a large proportion of cases, may both be absent. In consequence of this frequent latency of the disease, and of the fact that it has not yet become customary to make thorough examinations in cases presenting merely the symptoms of indigestion, gastric ulcer often runs its course unsuspected. It may then terminate in a spontaneous cure (as in numerous reported cases in which, after death, the scars of healed ulcers have been found), or in sudden death from hemorrhage or perforation.

Every practitioner of the healing art needs to be very familiar with the symptoms and signs of gastric ulcer, because of its insidiousness and the grave dangers attending a failure to recognize and treat it in time; and since it so frequently masquerades in the garb of a more or less severe dyspepsia, you should look upon chronic indigestion not as a trifling matter, but always as a condition demanding a careful inquiry, and thorough physical examination at least. When the results of these, taken in connection with the symptoms, point toward the probability of ulcer, you will do well to give your patient the benefit of any doubt by instituting at once the very hopeful treatment hereafter to be described.

Ætiology.—It has not yet been decided positively what causes ulcer of the stomach, but it probably results from the corroding action of a gastric juice excessively strong in HCl ,

under certain predisposing conditions, such as chlorosis, and others not fully understood. The causes of hyperchlorhydria are, therefore, probably prominent among the causes of ulcer. The disease is said to be almost unknown among simple peasant populations that subsist upon vegetables mainly, or other plain, unstimulating food, and live almost entirely in the open air.

The Incidence of Ulcer as to Sex and Age.—Most authorities agree that gastric ulcer is more frequent among women than men, though a few report a contrary experience. Chlorosis which is very often accompanied by hyperchlorhydria is rarely seen, except in women, and movable kidney, which certainly predisposes strongly to HCl excess, is almost monopolized by women; and HCl excess is at least a nearly constant accompaniment, if not a demonstrable cause, of ulcer. The young are more subject to ulcer of the stomach than the old, while the contrary is true of cancer; three-fourths of the cases of ulcer are said to be in persons between the ages of twenty and sixty, and the largest proportion occurs between twenty and thirty. Since ulcer of the stomach is very often overlooked, or mistaken for something else, and indeed in many cases cannot be positively diagnosed during life, the only really reliable statistics concerning it are those from the deadhouse. These show two important facts:

1. Ulcer of the stomach is rather a frequent disease, various authors cited by Riegel having reported percentages of bodies found with either open ulcers or scars of healed ones, ranging from one to twenty. This would indicate an average of 10 per cent., which is doubtless too high; but it is altogether probable that at least 5 per cent. of persons dying from all causes either had gastric ulcer at death, or had had it at some time before.

2. The numerous autopsies made in all parts of the world have proved, beyond question, that a large percentage of gastric ulcers recover spontaneously, since the proportion of dead bodies found with open ulcers, to those showing scars of

healed ulcers is scarcely one to two, and according to some it is only one to three.

Pathology.—Gastric ulcer is the result of self-digestion of some portion of the mucosa during life. How this autodigestion takes place we are not in a position to explain, nor do we



FIG. 72.—The pyloric end of a stomach, showing an ulcer on the posterior wall. (From a preparation in the Museum University College.) About natural size. The ulcer measures $\frac{3}{4}$ by $\frac{9}{16}$ inch. It is oval, with deeply-cut overhanging margins; complete perforation of the coats of the organ having taken place so that there is a small cavity outside the organ. The floor is formed by thickening omental or mesenteric tissue. Bristles are placed in three openings, which are erosions into large arteries, branches probably of the coronary artery. From a young male who died from repeated hematemesis. (From Sidney Martin's "Diseases of the Stomach.")

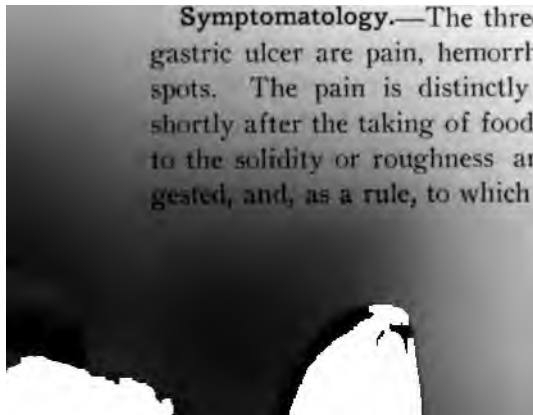
know how it is brought about in all cases. Certain it is that, before autodigestion occurs, the portion of the stomach wall must be either in a state of low vitality, or dead. Virchow suggests that thrombosis or infarction of the nutrient blood-vessels brings about conditions favorable for autodigestion,

and this view has been generally accepted, although it does not explain all cases. A general condition of ill health, and especially anæmia, seems to be a necessary predisposing factor. Gastric ulcer is circular or oval, having a punched-out appearance, with the edges but slightly changed. It thus differs from ulcers of inflammatory origin. It is cone-shaped, the excavation tapering by a series of terraces towards the serous layer. This form of the ulcer suggests its origin from an infarct, as the shape corresponds to the distribution of an end artery. The diameter of the ulcer varies from two to six cm. It may be larger and possess serrated edges. It is, as a rule, single, but may be multiple. Gastric ulcer is essentially chronic in its course, and heals generally by scar formation. It may lead to fatal hemorrhages, to perforation, or to adhesions with the neighboring structures. The cicatrix may bring about stenosis of either orifice, especially of the pylorus, or the hour-glass form of contraction, which sometimes divides the stomach into two almost separate pouches.

The following table from Welch's article on Simple Ulcer of the Stomach, in volume ii. of "Pepper's System of Medicine," shows the relative frequency with which the ulcer affected the different parts of the stomach in 793 cases upon which autopsies were made in various hospitals:

Lesser curvature	. . . . .	288 (36.3 per cent.)
Posterior wall	. . . . .	235 (29.6 ")
Pylorus	. . . . .	95 (12 ")
Anterior wall	. . . . .	69 (8.7 ")
Cardia	. . . . .	50 (6.3 ")
Fundus	. . . . .	29 (3.7 ")
Greater curvature	. . . . .	27 (3.4 ")

Symptomatology.—The three most prominent symptoms of gastric ulcer are pain, hemorrhage, and circumscribed tender spots. The pain is distinctly digestive, coming on usually shortly after the taking of food. It is proportionate in degree to the solidity or roughness and the quantity of the food ingested, and, as a rule, to which there are some exceptions, dis-



appears when the stomach has been emptied either by vomiting or in the normal way by propulsion into the intestine. The pain may be of any degree of severity. It is usually of a persistent burning or boring character, but may be violent or spasmodic. It is localized generally in the epigastrium somewhat to the left of the middle line and may radiate to the spine. Rarely the pain is felt in the back opposite the stomach, and not at all in front. The fact that it is not felt, or only very exceptionally felt, when the stomach is empty, and is either absent or greatly less in degree when only liquid food has been taken, is almost diagnostic of gastric ulcer, though the pain of hyperchlorhydria is sometimes similar in its manifestations. The latter pain, however, usually comes on later, not often until an hour or two after eating, and is apt to increase in severity up to the time when digestion is at its height, and taking more food, especially if richly nitrogenous, or large doses of alkaline drugs, relieves it, while the pain of ulcer follows often immediately upon the taking of food, and the more food generally the greater the pain. It may be nearly as severe at first as later, or become lighter as digestion progresses, and as the gastric contents are liquefied. But it is to be borne in mind that ulcer and hyperchlorhydria very often go together, and when they do, the pain resulting from the two combined conditions is likely to increase up to the acme of digestion from one to three hours after a meal, just as in cases of uncomplicated hyperacidity.

The hemorrhage may reveal itself either by the vomiting of fresh red blood (sudden and severe hemorrhage), or by dark changed blood (coffee-grounds vomit), or by the passage of tarry stools of altered blood (melena). The amount of blood lost may be small—even less than a teaspoonful—from the erosion of minute vessels, and be recognizable only by painstaking examination of the stools; or very large, amounting sometimes to eight, sixteen, or even twenty-four ounces at one time. A very copious hemorrhage from the stomach, showing itself by both sudden and severe hematemesis and black stools

of altered blood, points to ulcer rather than to cancer of the stomach, since in the latter disease it is unusual to see so much blood lost at once.

Marked tenderness on pressure over a small circumscribed area in the epigastrium, as well as often on the left side of the spine, over the origin of one of the last two or three ribs, is a very constant sign of ulcer—probably the most constant of all its signs and symptoms. The painful spot in front is in most cases very marked or acute, and is situated usually either just below the ensiform process nearly in the median line, or a little to the left of it. Exceptionally, it is lower down or still more to the left, and may even be found to the right of the median line. In such tender spots pain is evoked by a much lighter pressure than over the tender regions so often found in neurasthenics, which are just above or to the right or left of the umbilicus. The tender spots to the left of the spine are not so constantly present, but are found in about one-third of all cases of gastric ulcer. You should not forget, however, that in neurasthenic and hysteric patients there may be tenderness on pressure alongside the spine at various points, even in the absence of gastric ulcer.

Vomiting after taking food is another rather frequent symptom of gastric ulcer, though it is seen in so many other diseases that it is less diagnostic than the three cardinal symptoms already described. The vomiting of ulcer often occurs one or two hours after eating, when digestion is approaching its height, and is easy, as a rule, not accompanied by much straining. Moreover, its occurrence is followed by a cessation of the pain. In these two respects it differs from the vomiting of cancer, which is likely to be difficult, and is followed by little or no relief of the pain. The vomiting of ulcer may, however, exceptionally take place at any time after eating. The ejecta are most frequently partly digested food containing either a normal percentage or an excess of free HCl—*i. e.*, it will usually require from 20 to possibly 70 c. c. of a one-tenth normal soda solution to neutralize the free HCl in 100 c. c. of

the filtered stomach contents, and from 50 to 150 c. c. to neutralize the total acidity in the same amount.

If you are not prepared to make quantitative tests, it will be of importance to learn at least whether free HCl is present or not. To determine this, drop into a few teaspoonfuls of the stomach contents—the material vomited one to three hours after a meal—after filtering, if possible, 2 or 3 drops of a one-half of 1 per cent. solution of dimethyl-amido-azo-benzol in alcohol, that is, of the strength of 3 grains in 10 fluid drams of the latter. A brilliant red color will result if free HCl is present; otherwise the liquid will assume a yellow color. A very large excess of lactic, or possibly other organic acids may also produce a reddish color, and in doubtful cases, to be absolutely exact, you should verify such findings by the Günzburg test described in Lecture IX.

It is very exceptional in cases of ulcer to find the stomach contents deficient in HCl, though this does occasionally happen. Hemmeter has found hyperchlorhydria present in 88 per cent. This almost constant excess of HCl is one of the important corroborative signs of gastric ulcer, but it will not be prudent for you to introduce a tube in seeking for it in any case in which there has been a recent hemorrhage or other symptom of an acute ulcerative process in the stomach. The use of the tube under such circumstances is to be avoided as endangering perforation, though in hospitals and elsewhere, when it would be practicable to have prompt surgical intervention if needed, it is customary for experts to employ the tube cautiously in chronic cases of ulcer.

The complexion of the patient may be ruddy and fresh, though more frequently it is pale, especially after hemorrhages; or when there are severe intestinal or hepatic complications, it is likely to be sallow and almost cachectic.

The appetite is generally good—often excessive. This assists especially in differentiating ulcer from cancer and chronic atrophic gastritis, though not from simple hyperchlorhydria or splanchnic gastritis, in both of which a sharp appetite is the

rule. Constipation most commonly coexists with gastric ulcer, though not always; but it also complicates a majority of other gastric affections.

A tumor can be sometimes felt, especially in old ulcers involving dense cicatrices or adhesions with neighboring organs and when much hypertrophy of the pylorus has resulted. Such a tumor is usually small, of cylindric shape, smooth and immovable, instead of irregular, nodular, and freely movable, as is most frequently the case with cancer of the stomach.

Complications.—The most important are (1) rapid and possibly fatal collapse from the eroding of a large vessel with resulting serious loss of blood, which is not always vomited, and is to be recognized by the usual symptoms of shock (faintness, pallor, and cold extremities); (2) partial perforation with consequent patches of local plastic peritonitis and the formation of adhesions, a condition very difficult to diagnosticate,



FIG. 73. Perforated chronic ulcer. (From a preparation in the Museum of the Royal College of Surgeons. By permission of the Council.) Twice the natural size. The ulcer is shaped like an oyster-shell. It is funnel-shaped, and the ridges formed by the submucous and muscular coats are well seen. The peritoneum is perforated by an oval opening with clean-cut edges. (From Sidney Martin's "Diseases of the Stomach.")

since the only symptoms are a more persistent pain, and increased sensitiveness to movements of the adjacent structures, with sometimes very slight fever; (3) perforation with es-

cape of gastric contents into the peritoneal cavity, and the setting up of a more or less general peritonitis requiring often immediate operation and recognizable by the usual symptoms of that disease (a complication which occurs in 13 to 18 per cent. of cases); (4) subphrenic abscess, which is a rare complication of ulcer, but a serious one. As a result usually of a small perforation in the slow escape of the stomach contents into some portion of the space between the stomach below, diaphragm above, and, laterally, the liver, spleen or one or more of the other abdominal organs, a localized abscess forms which is walled off and is liable to rupture into any of the adjacent viscera, into the lung, finding its outlet, in the latter event, through one of the bronchial tubes, or into the peritoneal cavity, producing general peritonitis. The abscess often contains gas as well as fetid pus and food particles. The recognition of this condition must be made mainly from the physical signs after a thorough examination of both the thorax and abdomen, and the subject you will find fully discussed in the works on physical diagnosis. An examination of the blood in the event of such complication should reveal leucocytosis, which would be a corroborative sign.

Sequels of Gastric Ulcer.—A contraction, or even complete closure of either the cardiac or pyloric orifice of the stomach can result from the cicatrix of an ulcer. This very rarely happens to the cardia, since it is seldom the seat of ulcer, but is a very frequent occurrence in the pylorus or its vicinity. Such a stenosis of the gastric outlet becomes the cause of marked dilatation of the stomach with either rapid exhaustion and death, or a gradual, but very serious, and often fatal, impairment of the health. The crampy pains which had ceased with the healing of the ulcer may then recur, and vomiting of large accumulations of fermenting food occurs at intervals of a day or two with scanty urine, and the physical signs of a dilated stomach, as well as sometimes the finding of a small, smooth, elongated, immovable tumor in the pyloric region.

When ring-shaped ulceration has existed around any part

of the viscus, near its middle especially, there may result from the scars such a marked constriction as to produce the hour-glass stomach. Great prostration, profound anæmia, and even cachexia may be caused by frequent bleedings and vomitings, or from the ingestion of too little food through dread of the pain.

In 5 to 6 per cent. of cases, according to Boas, gastric ulcer is followed by cancer, which develops in its site, beginning usually at the edges of the scar. This change may be recognized by the appearance of the usual symptoms of gastric carcinoma, except that for a long time, sometimes till near the end, free HCl continues to be found in the stomach contents during digestion.

LECTURE LIII

THE DIAGNOSIS OF ULCER OF THE STOMACH

THE diagnosis of peptic ulcer may in certain cases be manifest at once from the group of symptoms present without any further examination than is required to find that the characteristic tender points are present; or, on the other hand, as Riegel forcibly puts it, one may meet with cases of it in which, "with the help of all our methods of investigation, it will be impossible to make even a probable diagnosis of the disease." This is especially true in the earlier stages, before large hemorrhages occur. Indeed, Ewald, Leube, Riegel, and other eminent authorities agree in admitting that an absolute diagnosis in suspected cases is often impossible, and all these strongly advise that in such cases the therapeutic test be made—that is, that the patients be placed upon the treatment appropriate to ulcer, when, if a cure or marked improvement result, it may be inferred that ulcer had been present. The probability that ulcer is present, and that, too, in an advanced form, is very great, however, whenever there are hemorrhages from the stomach which recur irregularly from time to time, without a very marked or steadily progressive loss of flesh and strength or the gradual development of cachexia, especially if there are no signs of hepatic cirrhosis or indications of so-called vicarious menstruation. If, besides, there are the characteristic pain and marked tenderness on pressure over the epigastrium near the ensiform process with or without a like tenderness to the left of the spine over the origin of any of the three lowest ribs, the diagnosis becomes reasonably certain. Vomiting daily after one or more of the meals, especially when the ejecta

contain a large proportion of free HCl, would, with the other symptoms mentioned, leave scarcely any room for doubt.

Hemorrhage from the stomach being the most diagnostic of all the single symptoms of ulcer, it is very important to determine positively the source of any blood supposed to have been vomited. When it comes from the stomach, it is not frothy from intermingled air, and is likely to be darker in color than that from the lungs, except in the largest hemorrhages, and will be almost certainly followed by the appearance in the stools of black, tarry masses containing altered blood. The patient will usually be conscious of the fact that it was not coughed up, as in hemoptysis, but vomited. In very large hemorrhages from the lungs the blood may accumulate rapidly in the pharynx without any act of coughing, but there will then be an absence also of the act of vomiting, with the spasmodic contraction of the diaphragm which this involves. Bleeding from the upper air passages or the gums is generally easily recognized by examining the parts. The blood would be bright red, and be flowing or dribbling away continually. It must not be forgotten that blood from the nose, throat, or air passages may be swallowed and afterward vomited, and might then present the same dark and altered appearance as that produced by ulcer. Close observation and questioning of the patient should prevent any mistake arising from such an occurrence. It would be impossible for you to differentiate the hematemesis of gastric ulcer from that due to the congestion of early hepatic cirrhosis except by the concomitant signs and symptoms of the latter disease, and the absence of the pain and tenderness characteristic of typical ulcer.

Vomited blood may not only exceptionally proceed from varices in the esophagus or stomach, but may result from the stasis of heart disease. When you can exclude both cardiac and hepatic disease, as well as other causes of portal obstruction, and so-called vicarious menstruation, you may generally infer the existence of either ulcer or cancer as the cause of the

bleeding, and their markedly different clinical pictures should render the diagnosis between them easy.

Aneurismal and atheromatous changes in the arteries of the stomach are mentioned by Riegel as possible causes of hematemesis, but such a causation is probably rare. Then it should be borne in mind that blood may be vomited in hysteria, scurvy, and purpura hemorrhagica, not to speak of such acute affections as cholera and yellow fever. It is said that there may be vomiting of blood having the appearance of coffee-grounds in the crises of locomotor ataxia, but this must be very unusual.

There are cases of so-called vicarious menstruation through the stomach, but in these the periodicity of the hematemesis and the failure of normal menstruation, as well as the absence of the signs and symptoms of disease in the stomach, should prevent any possible mistake.

The Diagnosis from Ulcer of the Duodenum.—Round ulcer of the duodenum needs to be differentiated. It usually affords symptoms similar to those of gastric ulcer (though more frequently even than the latter it runs its course without any symptoms), except that hematemesis is much less common, the blood in case of hemorrhage being more likely to pass off by the bowels exclusively, and the pain, as well as the area which is painful on pressure, is more on the right side, usually in the prolonged right parasternal line about one or two finger breadths below the gall-bladder. Besides, the pain rarely comes on until several hours after eating. Vomiting may occur, as a reflex probably of the pain, but usually does not relieve the pain, as it does in gastric ulcer. Hyperchlorhydria is by no means so constant an accompaniment as in ulcer of the stomach; indeed, some authors hold that there is more frequently a deficiency of HCl with the excess of organic acids. Duodenal, is less prevalent than gastric, ulcer, and, unlike the latter, is very much more frequent in men than in women—79 per cent. are in men according to Collin—and about one-seventh of all the cases are in children under ten years.

You will need to think also of the pain from gall-stones—hepatic colic—but here the pain and tenderness are considerably to the right of the median line, the pain is usually far more intense, and there is no connection between the attacks and the period of digestion. Hemorrhage will be absent, and jaundice with some fever usually present. Murdock has suggested that the administration of full doses of orthoform may help to decide as to the existence of ulcer in doubtful cases. This drug is very effective in relieving pain in ulcerated or abraded surfaces, but useless for merely gastralgic pain. He has found it to give prompt relief in gastric ulcer.

Differential Diagnosis.—In summarizing the points in the differential diagnosis between gastric ulcer and the diseases which resemble it, I cannot do better than to follow the lead of Ewald and other authors, who have grouped the symptoms in a tabular form. This I have done, and present for you the results in the following table, in which the observations of numerous high authorities, as well as my own, have been carefully compared and sifted, all statements having been omitted as to which there is not a concurrence of several observers:

	<i>Ulcer of the Stomach</i>	<i>Excess of HCl, with or without Gastritis</i>	<i>Cancer of the Stomach</i>	<i>Gastralgia</i>
Pain	There may be all forms and degrees. Comes on at variable periods after eating, often within half an hour, and lasts till the stomach empties itself either in the normal way or by vomiting. May be boring or burning, but is often spasmodic. Worse after solids. Felt in certain spots and increased by pressure there.	Comes on one to three hours after eating, and apt to continue during the remaining period of digestion. Usually of burning character. Relieved by more food, especially nitrogenous, or large doses of alkalies. Pressure neither increases nor relieves it.	Usually not violent, but continuous. Not relieved by vomiting, by more food or by alkalies. Not increased by moderate pressure, though deep palpation may aggravate.	Not connected with the taking of food or limited to the period of digestion. Comes on in spells at irregular intervals, often many days apart. Often relieved by pressure. Associated sometimes with neuralgia elsewhere.
Hemorrhage	Either small or large amounts of blood may be vomited, of either red or dark color, and this is apt to recur one or more times before controlled. Then no further hemorrhage usually for weeks or months. Following the hematemesis brownish-black altered blood generally in stools.	No blood vomited or passed by bowels.	Small (rarely large) amounts of blood are vomited at times, usually dark like coffee grounds. The relatively small hemorrhages may recur frequently, the blood showing both in the vomit and stools.	No blood is vomited or passed with stools.

	<i>Ulcer of the Stomach</i>	<i>Excess of HCl, with or without Gastritis</i>	<i>Cancer of the Stomach</i>	<i>Gastralgia</i>
Vomiting	A frequent symptom, and liable to occur daily. Comes on either shortly after eating or later. It is usually easy, not accompanied by straining. Amount proportioned to size of last meal. Ejecta rarely rancid, but show free HCl. Vomiting usually relieves the pain.	Less frequent, but happens in the worst cases, when it occurs at about the acme of digestion—one to three hours after eating. Vomiting usually relieves the pain.	Likely to occur once in two or three days only, when large amounts of sour and offensive matter are ejected, showing absence of free HCl and often presence of lactic acid. The vomiting often accompanied by straining. Vomiting does not relieve the pain as a rule.	Vomiting exceptional, and when it does occur, in no way characteristic.
Gastric Secretion and Digestion	Free HCl usually in excess and very active digestion of meat, eggs, and milk; starch digestion delayed.	Free HCl always in excess during digestion, which is active for proteids and slow for starch.	Free HCl generally absent or deficient, and digestion of proteids poor, except in that form of cancer which develops in the site of an ulcer. Lactic acid usually present. Boas-Oppler bacilli usually discoverable in stomach contents.	No constant departure from normal conditions. Digestion usually good.
Tumor	None except in old complicated cases, when a small, smooth, cylindric or egg-shaped resistance may sometimes be made out in the region of the pylorus. It is usually fixed and immovable.	None at all.	A palpable tumor develops at some stage in nearly all cases. It is usually uneven, sensitive on palpation, and movable, not fixed.	No tumor.
Perforation	Always possible, and may occur in persons who have not previously complained.	Never occurs.	Never in the earlier stages, but in the last stage occurs in six per cent. of all cases.	Never occurs.
Complexion	Fresh and ruddy often, except when ulcer has long continued; anemia and complications, but pallor follow each hemorrhage, but are full in recent cases, except when ulcer is associated with chlorosis.	Variable; often sallow from intestinal and hepatic complications, but sometimes healthy in recent cases.	Bad after the first stage, and becomes progressively worse until cachexia established.	Most frequently pale, from impaired general health.
Flatulence and Belching	No offensive belching, but likely to be much flatulence in the bowels. Apt to be much fermentation of the carbohydrates.	The same as in ulcer.	Usually marked flatulence; much offensive gas passing both ways.	Little or no gas may pass either way, but sometimes excessive nervous belching of odorless gas.
Appetite	Generally good, but patient often prevented from eating by fear of the pain.	Usually sharply increased, but exceptionally poor in advanced cases with gastritis.	Bad nearly always.	Good as a rule, but may be capricious.
Tongue	Red and often dry; may be coated at the back. Pale after hemorrhage.	Clean and red as a rule, but often coated at the back.	Pale and badly furred.	May be normal or in any condition, according to complications.

	<i>Ulcer of the Stomach</i>	<i>Excess of HCl, with or without Gastritis</i>	<i>Cancer of the Stomach</i>	<i>Gastralgia</i>
Age	Most frequent between twenty and forty, but very common in middle age and occurs in old age.	Most frequent in middle life, but may occur at any age.	Rare before thirty; most frequent in advanced years.	Most frequent between the ages of eighteen and thirty-five.
Sex	About twice as frequent in women as in men.	Probably no marked difference.	Statistics disagree. Probably no important difference.	Much more frequent in women.

LECTURE LIV

THE TREATMENT OF GASTRIC ULCER— EROSIONS OF THE STOMACH

THE mortality from gastric ulcer has greatly lessened as a result of recent improvements in the treatment. Brinton estimated it at 50 per cent., whereas it is now stated by several authors as not exceeding 10 per cent. In any case, the prognosis will depend upon many things—the absence of serious complications, the youth and vigor of the patient, and, above all else, his ability and willingness to submit to a course of methodical treatment in bed. When the special ulcer rest cure is instituted and strictly carried out during an early stage of the disease, recovery nearly always follows within a few weeks, and is often permanent. When the affection has long existed, and the ulcer is deep, as shown by large hemorrhages, the outlook is less favorable. When it is complicated by gastritis, the disease is likely to be very obstinate, and when stenosis of either orifice has resulted, a cure is impossible without surgery. A considerable proportion of cases heal spontaneously in the course of time—often many years—under favorable circumstances, in consequence probably of a diminution in the secretion of the gastric glands, the excess of HCl having, as a result of exhaustion or atrophy, given place to a deficiency of the same. But there are few, if any, diseases in which skilled treatment at the proper time can accomplish such brilliant results.

Treatment, Prophylactic.—In every case of marked HCl excess, especially if there is pain at the height of digestion, you should consider that ulcer is threatened, if not already present,

and insist upon a rational and persistent treatment until normal conditions have been restored, and even then urge strenuously that the patient so alter his diet and unhygienic mode of life, that there shall not be a speedy return of the secretory derangement. For instance, it is quite useless to cure a patient of hyperchlorhydria, if, so soon as you pronounce the percentage of HCl in the stomach contents to be normal, he be permitted to eat irregularly, hastily, and excessively a diet consisting mainly of meat and other stimulating animal foods, with acids, alcoholic liquors, the sharpest condiments, and other things that are highly exciting and irritating to the gastric glands, especially if at the same time he exercise little and overtax his brain and nervous system in many ways. It ought to be possible to make such a patient understand that the same causes which produced his disease before will still more easily produce it again, if he continue to keep them in action.

Cure the hyperchlorhydria, then, by the methods which I have hitherto described, including full doses of alkalies and belladonna or atropine, not forgetting that, next to a bland diet, intragastric faradism, applied by a first-class high-tension coil five to eight minutes every other day, will often succeed after medicines have failed to reduce the HCl secretion to the normal.

Moreover, since anæmia and chlorosis predispose strongly to ulcer, you should endeavor always by exercise out-of-doors, cool or cold sponge baths and other measures, both hygienic and medicinal, to improve the quality of the blood. When in such cases the stomach is not too sensitive, you may often administer safely such mild ferric preparations as Blaud's pills, neutral solution of the albuminate of iron, etc., and when these do not suit, preparations of bone-marrow often meet the requirements well, increasing the number of red-blood corpuscles without disturbing the stomach. The tincture of iron, which is usually remarkably effective in other cases, will aggravate any case in which there is excess of HCl, and the milder preparations of iron should, therefore, be chosen here.

I have sometimes found 1- to 2-teaspoonful doses of Roncegno water to suit well.

Treatment, Curative.—A recent French writer, Lemoine, lays down two fundamental indications in the treatment of gastric ulcer: (1) To put the stomach at complete rest, and (2) to modify the gastric secretion, that is, reduce the hyperchlorhydria. To do these things effectively is often sufficient, but Lemoine very properly adds these further special indications:

(1) Quiet the pain. (2) Allay vomiting. (3) Prevent dilatation of the stomach. (4) Preclude or arrest hæmatemesis. To which I may add: (5) Prevent perforation.

The diet with confinement to bed must be depended upon mainly for the fulfillment of all the above-mentioned indications. To put the stomach at rest physically and functionally, it will be necessary, first, to keep the patient in bed for a time—three weeks at least, and four to six weeks are better—and for one week to feed exclusively per rectum, or longer in the worst cases. Fox, Forster, and Williams first advised such a rest cure for ulcer of the stomach, but to Ziemssen and Leube in Germany belongs the credit of proving the efficacy of the method and establishing it in the favor of the profession. It ought to be self-evident that for the healing of an ulcer, as well as for the repair of a broken bone, absolute rest of the part is indispensable; and the only way to effect this, in the former case, is manifestly to have the patient lie in bed, which secures physical rest to a large extent, and then to stop for a time feeding by the stomach, so as to prevent the gastric peristalsis and the functional work of the glands with their irritating secretion of HCl. Besides complete physical rest with rectal feeding at first, the Ziemssen and Leube method comprises also the use of hot poultices or hot compresses over the stomach. These should be kept constantly in place, being held there by flannel belts with oiled silk or other impervious material between, the better to retain the moisture and heat, and prevent wetting of the patient's garments or the bed. These hot applications

should be changed by day every two or three hours at least, or much oftener when there is acute pain, but if well covered, the wet compress will retain sufficient warmth to be left on safely all night.

The nutrient enemata should be introduced two to four times a day, according to the tolerance of the bowel, after a preliminary clyster of salt and water for cleansing, and may consist of any of the following, which need not necessarily be predigested: Good fresh milk, freshly expressed beef juice, meat powder or Somatose dissolved in milk or water, raw eggs, solutions of sugar, butter or olive oil (not more than an ounce or two of the latter a day, lest it provoke loose stools), and solutions of very thoroughly cooked starch. A pinch of salt should be added to each enema. (See Lecture XXI. for further particulars concerning rectal feeding.) It is probable that in cases in which the organism is in urgent need of food, there occurs a reversed peristalsis, by means of which much of the food injected is conveyed to the small intestine, where it is digested.

Ewald recommends as a good enema the following: Two to three eggs are beaten up with a tablespoonful of cold water. Then a tablespoonful of prepared cereal dextrinized by heat is boiled with half a tumbler of a 20 per cent. solution of grape sugar and a wineglassful of claret added. When this is lukewarm, stir in the beaten eggs and add 15 grains of salt.

Dorkin, in a large series of cases, has continued rectal feeding for twenty-three days with good results, and in one case in my own practice the patient was nourished exclusively by the rectum for four weeks without serious loss of flesh or nutrition, but in gastric ulcer, unless hemorrhage should continue (a most unlikely event under such a method of treatment), very cautious feeding by the mouth can be resumed usually by the end of a week. Milk and limewater, equal parts, will constitute the best food to begin with, and when there is any remaining irritability of the stomach, it will be well to give half a tumblerful every hour for a day or two, though sometimes it is necessary to begin with a tablespoonful

every half hour. After the first few feedings, and with the vomiting over, equal parts of milk, limewater, and ricewater, or barley water may be taken in the same way. After two days, the amount of this combination can usually be increased to one or one and a half tumblers every two hours, provided there be no decided atony or dilatation of the stomach. Meanwhile, it will be advisable to continue the administration daily of two enemas at least for another week, in addition to the restricted feeding by the mouth. Beef tea or bouillon is early added to the diet by some, but such preparations are little more than solutions of the meat salts, which are exceedingly stimulating to the gastric glands, and are therefore best not introduced into the stomach in such cases. Lightly boiled or poached eggs without pepper, and only slightly salted, are much safer, and one of these may be allowed once a day in addition to the milk mixture from the fourth to the seventh day; twice a day from the eighth to the eleventh day, and thereafter three times a day. Calf's-foot jelly makes another bland and nourishing addition at this stage.

After the eighth day, the patient is to be allowed every three hours a larger feeding as follows: Two tumblers of the milk mixture, in which a cracker may be dissolved, and besides, once a day, instead of the milk, a tumbler of a smooth, well-strained purée made of corn, peas, celery, or asparagus; this, in addition to the eggs or calf's-foot jelly, provided always the stomach proves to be tolerant of the additions.

By the end of two weeks it is usually safe to add some of the blander starchy preparations, such as flaked rice, Cream of Wheat, Oat Flour, and other similar finely ground and bolted cereals, which are to be thoroughly well cooked and served with fresh milk or even good fresh, sterile cream, when the latter is well tolerated, but not with sugar. Still better are the well-dextrinized cereal foods now on the market including Force, Grape Nuts, etc. Small feedings every three hours, limited strictly to such viands as those above mentioned, with the early addition of good stale bread and butter, and baked white

potato, thoroughly masticated, should be insisted upon for fully three weeks, and then a more liberal, but rational, diet may be gradually resumed. The patient will be safer without meat, especially meat fiber not hashed, for months after his apparent recovery, and should avoid still more stringently, for a longer period yet, all alcoholic beverages, spices, or condiments (except sparingly table salt), the sharper acids, as vinegar and very acid fruits, the coarser or cruder vegetables, fried foods, pickles, and all the coarser grains. The ordinary rough, unbolted oatmeal and bran bread, as well as the hard crust of any bread, dry toast, zwieback, etc., are hurtful in these cases, being mechanically irritating, unless previously softened or chewed a very long time before swallowed. (See Lecture XX.)

Massage, during the rest in bed, should be given once or twice daily over the entire body, except the abdomen, which must be strictly avoided—because of the stimulating effect upon the gastric glands. Constipation must be overcome by saline laxatives,—magnesia, sodium sulphate or the Carlsbad salt, except when these disagree, as rarely happens. In case they do, it is usually better to rely upon douches of the colon with salt water or clysters of olive oil, rather than to risk administering the stimulating cathartics.

By the end of three or four weeks, in most cases, you should begin very gradually to accustom the patient to exercise again, in the same way as after the Weir-Mitchell rest treatment of nervous diseases.

Treatment, Medicinal.—The milder cases, that receive this treatment by rest, rectal feeding, and very restricted diet, will require little medicine for the main disease, and there are not likely to be any complications demanding special treatment in cases thus managed.

If there should be pain or vomiting in spite of the regimen just described, pellets of ice swallowed and allowed to dissolve in the stomach will frequently afford relief. These are useful also to quench thirst during the period of exclusively rectal feeding, and at the same time the mouth may be rinsed as

often as desired with cold water. If there should be very much thirst in spite of these measures, small sips of cool water may be allowed as often as necessary. When there is persistent pain or burning, with no food or only liquids being taken by the mouth, it is usually dependent upon excessive HCl, and relief will then usually follow the administration of half to one teaspoonful doses of sodium bicarbonate dissolved in a tumbler of warm (not hot) water. The same should be given half an hour before the three chief feedings daily when the HCl secretion continues large. In all cases that prove stubborn, and in the severe or advanced ones from the start, it is well to institute the Kussmaul-Fleiner treatment with very large doses of bismuth-subnitrate. Fleiner washes out the stomach before breakfast, and then introduces through the tube 10 to 15 grams of bismuth— $2\frac{1}{2}$ to 4 drams—suspended in about 6 ounces of water. But I have found that administering 40 to 60 grains in a draught of water, three times a day an hour before food, usually answers every purpose, even without a preliminary lavage. The result of this rest and restricted diet is in most cases remarkable in relieving the pain, vomiting, and other symptoms. Singularly enough, so far from always constipating, I have found these large doses sometimes to aid in overcoming constipation, the stools actually becoming more satisfactory than before. When, however, there is a contrary result, enemas of 4 to 12 ounces of olive oil, or cotton-seed oil, every two or three nights, will usually secure good movements without irritation.

As the design is to have the bismuth form a protective coating over the mucous membrane of the stomach, it might be as well to imitate Fleiner's method, without using the tube, by having the patient take 2 drams of the bismuth suspended in a glass of water upon an empty stomach early every morning at first, and every other morning later on, after a few days of such treatment. In cases complicated with acid gastric catarrh, however, in which a profuse secretion of mucus covers the membrane, it is better, provided there has been no hemorrhage

for a long time, to first wash out and then introduce the remedy through the tube, the patient meanwhile being caused to lie down in such a position as to allow the bismuth to fall especially upon the part of the stomach where the ulcer is located. There would be a manifest advantage in thus following the Fleiner method exactly, when the tube can be used skillfully and gently without endangering a hemorrhage. Fleiner himself is enthusiastic as to the results of this treatment, claiming that even hemorrhage is controlled by it.

My own experience with the bismuth treatment has been very satisfactory, and I have not found it necessary to use the tube at all in ulcer cases; but have administered the drug in 30 to 40 grain doses in water, every three to six hours before food—*i. e.*, on an empty stomach.

Treatment of Complications and Sequels.—Copious hemorrhage is not to be feared while the patient is on a strict rest cure with the diet already laid down. If it should occur under other conditions, put the patient immediately to bed, feed by the rectum, administering small pellets of ice by the mouth, and place an ice bag over the epigastrium. The tube is distinctly dangerous in these cases in most hands, yet Ewald records having checked otherwise uncontrollable hematemesis by washing out the stomach with ice water. You will do well to give large doses of bismuth suspended in limewater. A good soluble form of ergot should also be injected hypodermically, and repeated if necessary. Stimulate per rectum and hypodermically, when collapse threatens, keep the head low and maintain the body heat.

For a very small or partial perforation, setting up a local plastic peritonitis, employ ice as in hemorrhage, and secure perfect rest. Medicines would not usually be necessary, except opium, to prevent peristalsis. It would be wisest to call in consultation a surgeon, in all threatening cases at least. Time is the best remedy for the painful adhesions, with help from very gentle massage, and sometimes large doses of the continuous electric current—galvanism—applied percutaneously.

In the case of a complete perforation into the peritoneal cavity, a skilled abdominal surgeon should be summoned immediately, and meanwhile absolute rest of the patient secured with abstinence from food or drink (except ice pellets), and an ice bag should be placed over the abdomen. Opium in full doses is also desirable for its quieting effect.

Cicatricial contraction of either orifice of the stomach converts the case into a surgical one, and operative intervention should then be insisted upon as indispensable. When this is declined, something can be done in moderate strictures of the pylorus producing gastric dilatation, by controlling the hyperchlorhydria and keeping the stomach contents from becoming too acid. Full doses of sodium bicarbonate (a teaspoonful or more dissolved in warm water), or sometimes better yet, a mixture of other alkalies, as magnesia usta, prepared chalk, and bismuth subnitrate, so combined as to keep the bowels in a proper condition of openness without looseness, administered several times a day, will in most cases effect this, and thereby generally lessen the dilatation by preventing spasmodic closure of the pylorus.

Whenever cancer develops in an ulcer, the case also becomes one for surgery. If you should be fortunate enough to recognize this change at a very early stage, an operation may prove curative, or at least should greatly prolong life.

Erosions of the Stomach.—A pathologic condition of the gastric mucosa characterized by pain and hemorrhages which are sometimes severe, showing in the wash water after lavage pieces or shreds of membrane, has been described by numerous writers, and been variously classified. It presents analogies both to chronic gastritis and to ulcer, but does not correspond entirely with either in its symptomatology. It is relatively very much less frequent than either, and quite rare in a severe form. Its pathology is not yet understood, since, so far as I know, no fatal cases have been reported. Einhorn classifies this as a separate disease which he considers to have resulted from chronic gastritis. The condition would appear

to be one of superficial exfoliation of the upper layer of the mucosa, somewhat more marked than is usual in chronic gastritis and the name Erosions of the Stomach implies that raw surfaces are left in places which account for the pain after taking food, as well as for the occasional hemorrhage, since branches of the blood-vessels supplying the mucosa are sometimes eroded.

Hemmeter, who does not consider erosions of the stomach as a separate disease, finds this condition generally characterized by hyperacidity (by which he doubtless means an excessive secretion of HCl), and finds that it yields often to a milk diet. Einhorn has observed it in association with both an excessive and deficient secretion of HCl, but more frequently the latter. Riegel makes no special mention of it, but describes a similar condition in his account of the complications of gastritis, while Stockton, in a note to the American Edition of Riegel, inclines to Einhorn's view of the trouble.

The treatment of this condition when it complicates a chronic gastric catarrh, should, in the main, be the same as for ulcer, but may include also lavage and other intragastric methods which would be unsafe in ulcer. Einhorn recommends lavage followed by spraying the stomach with a 0.1 to 0.2 per cent. solution of nitrate of silver, and also by intragastric galvanization.

LECTURE LV

ROUND ULCER OF THE DUODENUM

PEPTIC or round ulcer of the duodenum is very much less frequent than gastric ulcer, and is still more likely than the former to run a latent course until a severe hemorrhage, or even perforation and general peritonitis call attention to it. Ulcer of the stomach is variously estimated to be from ten to over thirty times as frequent. The relative ratio of frequency, however, of gastric to duodenal ulcer is most commonly given as ten or twelve to one.

Duodenal ulcer differs from gastric ulcer in several notable particulars. The former is more common in men, and between the ages of 20 and 60; the latter in women, and between the ages of 20 and 30. Ulcer of the duodenum not only oftener runs a latent course, but is also much more refractory to treatment, decidedly more liable to perforation as well as to obstructive cicatricial contraction, and in consequence is a more dangerous disease than ulcer of the stomach. It also occurs relatively often in infancy and childhood, while ulcer of the stomach is rarely ever encountered under the age of 10. Its most usual site is at the upper end of the duodenum, between the pylorus and the opening of the common bile duct and pancreatic duct. Generally it is quite close to the pylorus, though it sometimes appears lower down, and exceptionally may be found in any part of the duodenum, or even in the upper part of the jejunum. It varies in size from that of a pea to that of a twenty-five-cent piece, or even, exceptionally, to that of a dollar.

Ætiology and Pathology.—The causes and histologic peculiarities of ulcer here are practically identical with those of

gastric ulcer, except that extensive burns of the skin may often in some obscure way produce the former, and the ulcers from such burns are usually much longer than broad and are jagged in outline. Boas mentions also as possible causes, freezing, erysipelas, septicæmia, etc. Being supposedly dependent upon the same digestive action of the gastric juice upon portions of the mucosa having a lowered vitality, the result is naturally the same—a punched-out, funnel-shaped ulcer, usually single, though sometimes multiple, extending down through the submucosa and muscular layer, and still more frequently than when in the stomach perforating with the result of producing either adhesions to adjacent viscera or general peritonitis. Duodenal ulcer when it heals is likely to produce more serious results from scar formation than when situated in any part of the stomach, other than the pylorus, because the duodenum is so much smaller that obstruction of the lumen more certainly follows cicatricial contraction.

The Symptoms of Duodenal Ulcer.—As already mentioned, there may be no symptoms at all, and such a latent course is far more frequent in this than in gastric ulcer. The symptoms when present are very similar to those in the former disease, and yet present some decided differences. There is likely to be the same burning or boring pain, but instead of coming on directly, or within a very short time after food has been taken, it is rarely felt until at the end of two to four hours, and often not until after five or six hours, that is, not until the contents of the stomach at the termination of peptic digestion, have all passed into the duodenum. The pain does not, as a rule, radiate toward the back, but upward or downward. The pain, too, is not increased by taking more food or alcoholic drinks as in gastric ulcer, but may rather be helped by these. There is also usually tenderness on pressure, but it is almost uniformly felt to the right of the middle line near the lower border of the liver, or a little lower down in the right hypochondrium. But since the site of the ulcer is usually very near the pylorus, and the latter is not infrequently much

displaced downward, the situation of the pain and tenderness may be changed accordingly. Vomiting may occur, but more rarely than in gastric ulcer. Hemorrhage is quite as likely to result, but when it does, is usually different from that seen in ulcer of the stomach, in one very important respect especially. That is, blood is rarely vomited without at the same time some of it passing off by the bowels, either in an unchanged or slightly changed form or as melena, whereas, in ulcer of the stomach it frequently happens that all the blood lost is vomited, none being left to escape by the bowels. And, on the other hand, it is much more common in duodenal ulcer to find evidences of blood in the stools when none at all has been vomited. Exceptional cases, however, have been reported of duodenal ulcer in which there was hematemesis without blood in the stools. Another feature of the hemorrhage in these cases is that when hematemesis occurs, the vomitus will at first contain nothing but food remains or chyme, and then, later, the blood will come up, possibly mixed with bile. In the hematemesis of gastric ulcer the blood is likely to come up at once with the food previously taken. This is a highly important diagnostic point. The bleedings may be moderate and recur frequently or speedily cause death. Ewald insists that according to his experience the gastric juice in duodenal ulcer more frequently than otherwise shows only a normal or sub-normal percentage of HCl, instead of an excess, as is the rule in gastric ulcer. Boas, however, reports a contrary experience, and has usually seen hyperchlorhydria with ulcer of the duodenum. He also calls attention to the fact that it is precisely those cases which have been without symptoms, the patients feeling and looking well, that are most likely to develop serious hemorrhage or perforation, while those in which there have been long-continued symptoms, such as pain after food, tenderness on pressure, etc., more rarely experience such accidents.

Constipation very often coexists with duodenal ulcer, but perhaps not oftener than in most other dyspeptic troubles.

Jaundice is a somewhat rare symptom, but when encountered is very significant as to the situation of the lesion, increasing the probabilities that any existing ulcer is in the duodenum, and not in the stomach.

Diagnosis.—Notwithstanding that the above described symptoms present numerous marked differences from those found in ulcer of the stomach, it is often difficult, and sometimes impossible to decide whether the ulcer which is the obvious cause of bleeding, pain, tenderness, etc., is situated in the stomach or intestine. Whether the ulcer is just above or just below the pyloric opening might be manifestly at times very hard to determine, especially when the stomach is small, and lies further to the left than usual, since then, an ulcer in the upper part of the duodenum might produce all the symptoms and signs of one in the pyloric part of the stomach. So, with an enlarged stomach or one much displaced downward and to the right, an ulcer of the pylorus might closely simulate one in the duodenum.

Boas has experienced the greatest difficulty in differentiating between duodenal ulcer and hyperchlorhydria. In both, pain comes on two to four hours after eating, and is usually relieved by taking more food or alkalies. The pain is also often referred in both, chiefly to the region of the pylorus, and there may be even in hyperchlorhydria some sensitiveness in the same region. He believes that frequently in such cases the diagnosis cannot be made, and whenever the patients do not improve speedily upon the diet suitable for hyperacidity, he advocates instituting the accepted cure for ulcer with confinement to bed, rectal feeding, etc. For the rest, the differential diagnosis of duodenal ulcer must be made from the crises of locomotor ataxia, gall stones, cancer, and sarcoma or other morbid growths, and none of these as a rule should occasion difficulty. In tabetic crises there must be the usual symptoms of tabes, and there would be no hemorrhage or pain on pressure, and no relation generally between the attacks of pain and the taking of food. Some forms of hepatic

colic are at times accompanied by a slight passage of blood with the feces, but the pain in these cases has again no connection with eating or drinking; the attacks do not usually last so long as the exacerbations of an ulcer and the pain is generally more violent. Then, besides, there is nearly always jaundice in the gall-stone cases associated as a rule with some enlargement of the liver, and a palpable swelling in the region of the gall bladder. Cancer or sarcoma of any of the structures in the right hypochondrium might raise some doubt in any case which has been only a short time under observation, but the course of either disease is so entirely different from that of ulcer that the diagnosis could soon be positively established. Cancer grows surely, and as a rule, rather steadily, worse in spite of treatment and has its marked cachexia in nearly all cases, while in duodenal or gastric ulcer there are generally long intervals of comparative health when the patient gains in flesh and strength and complains little or not at all.

Other morbid growths in the same region could scarcely mislead you, since they would not be painful or cause hemorrhage and could usually be palpated.

Complications and Sequels.—Chief among these, in addition to the hemorrhage, are local peritonitis resulting in adhesions to adjacent viscera with kinking, displacements, etc., causing possible obstruction of the bowels and gastrectasis, general peritonitis from perforation, cicatricial contractions narrowing the lumen of the gut and leading to dilatation of the stomach; or the perforation may cause fistulous connections between the duodenum and any of the neighboring organs.

Icterus is another possible result of duodenal ulcer, but a rare one, and calls for little comment. It signifies in such cases simply that the accompanying catarrhal inflammation has extended to the common bile duct, or at least to its opening, with the usual result of a partial obstruction of it.

Carcinomatous degeneration of the ulcer is a very serious accident which may happen in duodenal as in gastric ulcer.

It would be revealed by the development of the usual symptoms of a malignant growth, including a progressive lowering of the general health, more steady and continuous pain, cachexia, etc.

Prognosis.—In duodenal ulcer consequent upon burns of the skin, the prognosis is absolutely bad, there having been no case of recovery so far reported. Medical treatment fails, and

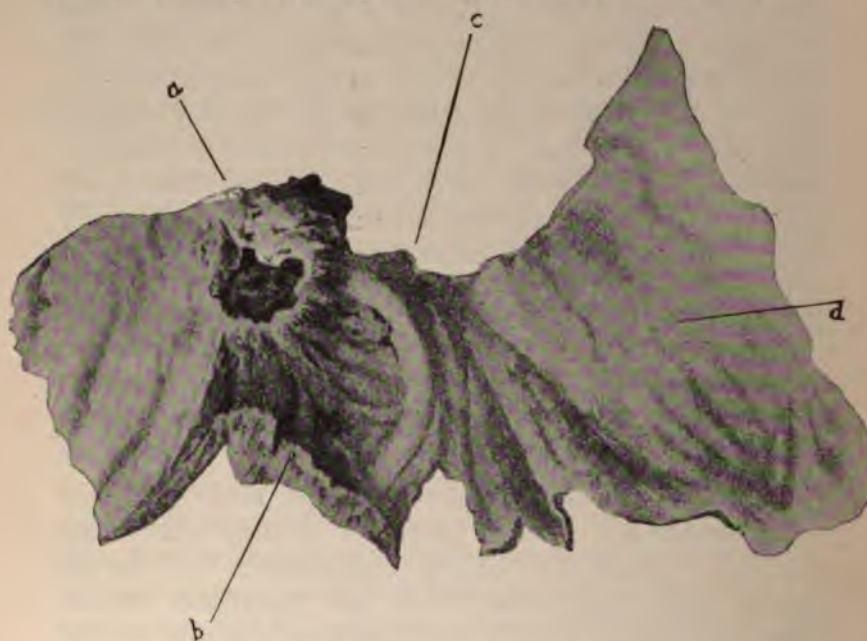


FIG. 74.—Carcinomatous ulcer of the duodenum. (*a*) the duodenal ulcer, the thickened edges of which, resembling a rampart, are the seat of carcinomatous infiltration; (*b*) transverse section of the thickened and infiltrated intestinal wall; (*c*) pylorus, which is also thickened; (*d*) stomach. (From "Krankheiten des Darms u. des Bauchfells," von Prof. Dr. C. A. Ewald.)

the condition of the patient does not usually admit of operative intervention. In other ulcers of the same part the prognosis is always much more serious than in those of the stomach for the reasons fully stated above.

Treatment.—In the main, the treatment of duodenal ulcer

should follow the same lines as that of gastric ulcer. Rest in bed, however, and the withholding of all food and of disturbing medicine by the mouth are more imperative than in the case of the latter. Full doses of bismuth should be administered as directed in the lecture devoted to that subject, and the other remedies therein recommended, including hot poultices, are equally applicable here, unless the tests of the stomach contents should show a deficiency of HCl, when alkalies need not be given. Orthoform in 5- to 7-grain doses may be added to each dose of the bismuth when there is much pain.

The danger of hemorrhage, perforation, etc., being greater than in gastric ulcer, and the results of such accidents more to be feared, when they do occur, the stomach tube ought not to be used, in any case in which ulcer of the duodenum can be reasonably suspected, except on a patient who is known to tolerate it well. It is the violent efforts of gagging and vomiting which are to be feared.

In another respect the course of procedure is different from that suitable in gastric ulcer. In the latter disease, non-operative measures, including a very careful diet and medicinal and mechanical therapeutics, have won some of their most brilliant victories, and good results are always to be expected from such measures, in the beginning at least; but in duodenal ulcer the prognosis being much less favorable, you should proceed more cautiously and protect both your own reputation, and the interests of the patient, by associating with you at the outset a competent abdominal surgeon. Then if the treatment prescribed succeeds, and the symptoms promptly subside, well and good; but if not, the surgeon will be in a better position to afford you efficient assistance, than if suddenly called in after a serious turn in the case. In the former event, continue the rectal feeding for two weeks if practicable, and then resume feeding by the mouth with even more caution than was advised for the treatment of gastric ulcer. If you should be so fortunate as to secure a recovery by these, or by any means, see to it that the patient thereafter so orders his diet and way

of living generally as to avoid a recurrence of such a dangerous condition, and this, notwithstanding the varying testimony upon the subject, will probably be best accomplished by combating any tendency of his gastric glands to secrete HCl excessively. For practical suggestions on this subject, see Lecture LIV., under the head of the prophylactic treatment of gastric ulcer.

If, after the disappearance of the symptoms in whole or part, there should be a return of them, indicating that the ulcer persists, by all means advise operative intervention without further delay. In the event of perforation, immediate operation will be necessary. In these, as in all cases in which surgical aid is likely to be needed, there should be the most cordial co-operation between the physician or physicians, and the surgeon. The life-saving achievements of both belong to the glory of the profession.

LECTURE LVI

TUBERCULAR ULCERATIONS IN THE STOMACH AND INTESTINES

CONTRARY to a prevalent impression, there is often present in the gastric juice an excess of free HCl in the early stages of phthisis. Numerous observers testify that digestive derangements of one kind or another are in a considerable proportion of cases the first symptoms complained of in conditions which later develop the usual signs of tuberculosis in the lungs or elsewhere. The most frequent tuberculous involvement of the stomach is by miliary tuberculosis. In such cases the gastric mucosa may be studded with tubercles. But true tubercular ulceration is rare in the stomach at any stage, especially without a similar involvement of the intestines. This is probably due to the fact that the acid of the gastric juice impairs the activity of the tubercle bacilli, and prevents their proliferation when swallowed with the sputum. When tubercular ulcers exist in the stomach, the symptoms are practically the same as those of simple peptic ulcer, and the treatment may be the same, plus the general roborant measures, especially hygienic and climatic, required for the constitutional condition. The absence of free HCl in cases showing the usual signs and symptoms of gastric ulcer might well lead you to suspect a tubercular origin, especially when either some part of the respiratory tract or any region of the body presents tubercular lesions.

Tubercular Ulcers of the Intestines.—The same holds true for ulcer of the duodenum. Neither in the stomach, nor as a rule in the duodenum, will tubercular ulcers be found so long as there is regularly a normal percentage of HCl secreted by the gastric glands, and it is probable that even a very limited

secretion of the same, so deficient as to leave no surplus in the free form, may yet exert such an inhibitory effect upon the swallowed bacilli as to prevent the development of tuberculous ulcers in these regions.

In the remainder of the intestine such ulcers more commonly occur, especially, according to Nothnagel, Boas, Pick, and others, in the lowest part of the ileum, and in the cecum, as well as in the sigmoid flexure and rectum, where there is more stagnation of the feces than elsewhere. Primary tuberculosis of the intestine in adults is exceptional, resulting then generally from infection through non-sterilized milk or other uncooked or insufficiently cooked animal foods. It is more frequent in young infants, and to a much less extent in older children. While the HCl of the gastric juice usually exerts a sufficient antiseptic effect to protect the stomach and duodenum, it does not necessarily kill the bacilli, so that when the food containing them passes on into parts of the bowel, the contents of which are alkaline, a favorable culture medium is met with, and infection may take place.

But, except in young children, tuberculosis of the intestine is nearly always a secondary process, the source of infection being as a rule the swallowed sputum. The affection is then usually characterized by diarrhea as well as the familiar symptoms of phthisis, viz., cough, profuse expectoration, emaciation, debility, fever, and night sweats. Sometimes palpation reveals swollen mesenteric glands, and often sensitive areas over the lower abdomen, corresponding to the sites of the ulcers. Tubercular ulcers in the jejunum or upper part of the ileum, without involvement of the lower bowel, may be accompanied by constipation.

Pathology.—The standard works on pathology have little or nothing to say of tubercular ulcer of the stomach, and the reports of such cases in medical literature do not for the most part go at all deeply into the subject of their pathology. It is believed, however, that the infection usually comes through the circulation, and not directly from food or sputum infected

with the bacilli. The ulcers may be either single or multiple, and of any size from that of a pinhead to that of a silver dollar. They rarely extend below the submucosa. Various authors are of the opinion that previously existing ulcers or erosions become the seats of the tuberculous process, the loss of substance, as in other cases, facilitating infection. Tubercle bacilli may usually be found in the necrosed tissue lying upon the surface of the ulcers as well as in remains of the glands.

Tuberculous ulcers of the intestines occur very much more frequently and their character has been exhaustively studied. They have been found in from 50 to 70 per cent. of all advanced cases of pulmonary tuberculosis. The infection is believed to be rarely primary except in infants, but as a rule secondary resulting from the bacilli in the swallowed sputum. The usual situation of such ulcers, according to Green, is the lower end of the ileum, but Ewald¹ says they are not only very common in the ileo-cecal region, but also in the descending colon, and wherever else the feces most stagnate. Some other writers assert that such ulcers are found most frequently in the rectum. They develop from miliary tubercles and chiefly in the solitary follicles and Peyer's patches, those occurring in the former being usually round, and those in the latter, oval in form. They often become confluent, and may then produce an extensive loss of tissue. They frequently perforate the walls of the intestine, producing, as in similar perforations elsewhere when the process is slow and adhesions have had time to form, patches of local peritonitis, or when the progress has been more rapid, a direct opening into the peritoneal cavity with a resulting general peritonitis. Healing of tubercular ulcers is not common, but when it does occur, is likely to produce obstruction of the bowel by the contraction.

Symptomatology.—In Lecture LVIII. on Intestinal Ulcers Generally, you will find described with sufficient fullness the symptoms which are fairly characteristic of any kind of ulcera-

¹ Die Krankheiten des Darms u. des Bauchfells, von C. A. Ewald, Berlin, 1902.

tion in the intestines anywhere, especially below the duodenum. The round ulcer of the duodenum has some features peculiar to itself. Apart from the general symptoms of tuberculosis, it would usually be impossible to determine from any local symptoms present that an ulcerative process revealed by the character of the stools, as well as by pain and tender spots over portions of the bowel, was of tubercular origin rather than due to some other cause. Bleeding is less common from tubercular ulcers than from those arising in the course of typhoid fever or dysentery, but this is equally true of catarrhal ulcers of the intestine. Boas cites Girode as authority for the statement that the stools passed in intestinal tuberculosis are often of a brownish-black color, similar to the coffee-grounds vomit seen in cancer of the stomach, and reports that this observation has been confirmed by his own experience, though, at the same time, he cautions that such peculiar stools are by no means always to be considered as having an admixture of blood.

Diagnosis.—The constant presence of abundant tubercle bacilli in the stools, or the occasional finding of even small quantities of the same at a time when the patient was not having any sputa at all, would render it very probable that some form of tuberculosis existed somewhere in the alimentary canal, especially if the same findings should persist after the patient had been placed upon a strictly vegetable diet so as to exclude the possibility of the bacilli having been ingested with tuberculous meat, milk, or other infected animal food. Generally speaking, however, the surest evidence that an intestinal ulceration was of tubercular origin would be the coexistence of the symptoms and signs of tuberculosis elsewhere in the body; and if at the same time numerous bacilli were regularly found in the evacuations, the diagnosis might be considered established.

The tuberculin test should be resorted to in any doubtful case in which there is a strong suspicion of primary intestinal tuberculosis, since in this way only can the diagnosis be certainly made, and you may now accept it as definitely decided

that this is not only a reliable, but a perfectly safe test when properly carried out.

Dr. Martin B. Tinker, of the Johns Hopkins Hospital, has recently reported the results of an exhaustive study upon this subject entitled, "The Value of Tuberculin in Surgical Diagnosis,"¹ and he fully confirms the claims made in behalf of this drug as a diagnostic agent at least, but points out clearly that the beginning dose must always be small—from 1 to 3 milligrams. The preparations vary somewhat in strength, and therefore, unless you know by previous experience the degree of activity of the one to be used in any given case, it will be well to inject at first the minimum amount. Then, if there should be no reaction by the end of twelve hours, it is usual to inject double the quantity; and sometimes it may be necessary to administer a third dose proportionately larger before it can be definitely decided that tuberculosis does or does not exist.

The reaction after a sufficient dose is generally both local and general. The former is shown by a rise of from 1 to 2 degrees in the temperature at the corresponding times of the day, together with lassitude and more or less vague distress, including often headache and sleeplessness. The local reaction consists usually of pain and tenderness in the affected parts, or if these symptoms existed before, they are much intensified. If there be a lesion in the lung, there are râles and disturbed respiratory rhythm where nothing of the kind may have been heard before. In the case of an intestinal ulcer there should be markedly increased pain and tenderness, with possibly an increased looseness of the bowels.

It is so extremely important to ascertain at once whether tuberculosis is present or not, that the time has now come when this one practically certain test for it should be resorted to, in all cases at least in which the question cannot otherwise be positively determined. With the proper care and precautions it is quite as safe as the old therapeutic test for malaria by giv-

¹ Vol. xi. of Johns Hopkins Reports, Nos. 1-9.

ing full doses of quinine, and much safer for weak patients than that of syphilis by noting the effect of large doses of iodide of potassium.

Prognosis.—Secondary tuberculosis of the intestine is practically a hopeless condition, and, as a rule, therefore, only a palliative treatment is possible. But the infrequent cases of primary tuberculosis of the bowel as well as of the stomach, when uncomplicated, should be curable if properly treated before the vital forces have been seriously impaired. Then, too, the cases in which incipient tuberculosis of other regions first reveals itself by symptoms of indigestion are to be considered. Hence the extreme importance of making the diagnosis at the earliest possible moment. Whenever persistent derangement of either the gastric or intestinal digestion is accompanied by progressive wasting, and even a slight regular or frequent rise of temperature after midday, tuberculosis may well be suspected, and the patient should be given the benefit of the doubt by instituting the appropriate treatment.

Treatment.—When there is stubborn diarrhea with fetid stools and sensitiveness upon pressure over circumscribed spots in the bowels, ulceration of some kind is to be feared, and there is the possibility, at least, that it may be tubercular. In such a case involving the colon the diseased process should be attacked with vigor locally, by the use of antiseptic colon douches, one of the most effective of which you will find to be a solution of carbolic acid in glycerin, 1 to 8, of which a teaspoonful may be diluted with a quart of water. Of this solution inject far up into the colon 1 to 2 quarts every other day, while on the alternate day the bowel is flushed out with a normal salt solution. Such simple curative measures should be carried out in any case, provided there are no contra-indications, since they are very helpful in even catarrhal ulceration of the intestines.

But my own experience has shown that carbolic acid or creosote administered in any considerable dose, either by the mouth or per rectum, will greatly stimulate the gastric glands,

increasing decidedly the secretion of HCl, so that in the considerable proportion of cases of early tuberculosis with gastric derangement, in which the HCl is in excess or at least fully up to normal, such remedies cannot be given without the risk of a marked aggravation of the indigestion, or even producing an acid dyspepsia where none existed before. These are the cases in which cod-liver oil, even in pretty full doses, is well borne and acts so favorably, and the explanation is furnished by experiments which have demonstrated that all oils and fats, including butter, tend to lessen the secretion of HCl. The creosote treatment, and the use of carbolic acid per rectum, suit best in the cases in which the HCl secretion is much below the normal, but even then, if there be chronic gastritis present, full doses by the mouth are likely to disagree.

The Tuberculin Treatment.—Once having diagnosed tuberculosis in an early stage, whether it reveal itself by digestive derangements, by primary tubercular ulcers of the gastro-intestinal tract, or in any other way or part of the body, so long as there are no serious hectic symptoms, showing a mixed infection, you will do well to give your patient, besides the best possible hygienic treatment, whatever advantage can be gained from a cautious employment of some of the antitoxic serums or tuberculins. It is a fact, even though one which is still sometimes disputed, that in small doses, increased in the most careful way (which is equivalent to saying in the most skillful hands), certain of the preparations or modifications of Koch's tuberculin have increased the percentage of obtainable cures in uncomplicated phthisis, in its first stage especially.

The preparations known as Tuberculocidin, Antiphthisin, Tuberculin R, and even the original tuberculin, very greatly diluted, are used successfully to-day by a number of the most distinguished physicians of this country and Europe. Indeed, some of the leading experts in tuberculosis, especially those practicing at the health resorts most frequented by consumptives, physicians who, therefore, have an enormous experience in this line, have used successfully very small doses of either

Koch's original tuberculin, or some modification of it from the first.

Dr. Whittaker's Method.—Dr. James T. Whittaker, of Cincinnati, in the able and exhaustive article on Tuberculosis contributed by him to Wilson's "American Text-Book of Applied Therapeutics" in 1896, stated that he had then been using Koch's original tuberculin for three years, and agreed with the statements of Klein that in minute doses it was "absolutely unattended with any bad effects." He thus described his method:

"I find it most convenient to prepare solutions of 1-100 of 1 per cent. (0.0001), and of 1-20 of 1 per cent. (0.0005). These two solutions, which are made with 1-2 of 1 per cent. (0.005) carbolyzed water, are kept in dark bottles in small quantities. The treatment should begin with one interspace of Koch's syringe of the 1-100 of 1 per cent. solution, and this should be used not oftener than every other day—preferably, sometimes, twice a week—and the quantity should be increased gradually one interspace at a time, in accordance always with the general condition of the patient." He added that, employed in the proper cases after the method described, he considered tuberculin to be "the most valuable of all the single methods of treatment in incipient tuberculosis."

During Dr. Whittaker's last illness early in the year 1900, his assistant wrote me regarding the former's further use of this remedy as follows: "The doctor still has the utmost confidence in the value of Koch's old tuberculin as a diagnostic agent, and in the efficacy of the new tuberculin, TR, in the treatment of cases of pure tuberculosis," adding: "Of course the remedy has no influence upon the sepsis of phthisis."

I had a limited experience with tuberculin in various forms during one winter spent in the South (1892-93), and for some time subsequently in Atlantic City, and, so far as this small experience goes, it confirms the views of Whittaker, Denison, Klebs, von Ruck, and many others, that certain of the tuberculin preparations are perfectly safe in proper doses, and exert

a positive curative influence in early tuberculosis which is uncomplicated with septic conditions. My own experience with these preparations leads me to infer that, in Whittaker's small doses, the original tuberculin is as safe and efficient as any of them.

Hygienic and Climatic Measures, etc.—In the treatment of tuberculosis of the gastro-intestinal tract, most of the usual modern methods are applicable, especially the hygienic, climatic, etc. These include a residence in a healthy climate, where the air is as pure as possible and not too moist. Sunshine is most important, and when practicable, a considerable elevation is of undoubted advantage to the majority of cases. But of even more importance than the choice of any particular climate is the indispensable condition that the patient shall be kept out of doors substantially all the time, except at night, properly clothed to prevent chilling and protected from rain or high cold winds. When there is fever, a recumbent position should be maintained out of doors, but otherwise moderate exercise is desirable. It is the oxygen of a pure, uncontaminated air that is probably the most valuable curative agent we have for tuberculosis. The diet should be suited to the condition of the digestive organs, but as abundant and nourishing as practicable. By *practicable* here I mean as much as the patient can be made to digest, oxidize, and assimilate. In a paper read before the American Climatological Association, in 1894,¹ I maintained that to force upon tuberculous patients an excess of food beyond that which can be oxygenated, can only work injury in the long run; that there is a direct ratio between the amount of oxygen consumed in the system (which is largely increased by both exposure to pure outdoor air and by exercise) and the amount of food that can be safely and helpfully ingested. This statement was acquiesced in by the distinguished speakers who discussed the paper, and it has not been since disputed.

¹ The Ratio which Alimentation Should Bear to Oxygenation in Disease of the Lungs, Transactions American Climatological Association, 1894.

Only a patient, unwearying study of each case by itself, with the help of occasional tests of the stomach contents, frequent analyses of the urine, a study of the blood, and in some cases chemical and microscopic examinations of the feces, can enable you to adapt to the varying conditions the diet both in quality and quantity, so as to bring up the nutrition to the highest possible point. Medicines by the mouth need to be administered with much discretion. This is the rock upon which some good physicians split in managing tuberculosis. Not enough attention is paid to the reaction of the digestive organs to the remedies administered. Many cases would do better without any drugs at all than with such as are commonly given, and in the usual doses; 1- or 2-drop doses of Fowler's solution of arsenic or of creosote suit most cases well, though I have seen some with a weak, irritable stomach in which tablets containing 1-10 drop of creosote acted most favorably; but when there is no excess of HCl, moderately full doses of the same remedies often do good. The same may be said of the hypophosphites, glycerophosphates, strychnine, and the stronger preparations of iron. They all disagree in the usual doses when the gastric glands are in an excited or irritated condition. Cod-liver oil, as mentioned above, may suit well when there is a normal or excessive percentage of HCl in the stomach, and then acts best when taken about two hours after meals. In cases of deficient gastric juice, HCl and pepsin should be administered, and creosote or carbolic acid may then be added to the mixture. When the ulcers involve the small intestine so that antiseptic or astringent remedies cannot be hopefully introduced by enema, full doses of bismuth by the mouth with ichthalbin or tannalbin, or tannigen in combination, or pills of silver nitrate with bismuth and opium will usually assist in controlling the diarrhea, at least temporarily. With the exception of the opium, the same remedies may often be continued for weeks at a time, with some hope of exerting a favorable influence upon the ulceration.

Hydrotherapeutic measures, especially the tonic use of cold

water, as in sponge baths, cool or cold affusions, etc., are often very useful. Breathing exercises and gymnastics to expand the chest, and for the development of the trunk muscles generally, are excellent; horseback riding is most valuable, and for those having a good circulation, cautious bicycle riding and mountain climbing are to be recommended.

Patients should be under the constant watchful care of a physician until well advanced in convalescence, and be cautioned especially against excess of every kind.

In certain selected cases of tuberculosis of the intestine without a serious involvement of other organs, surgery may now be resorted to hopefully. In the *International Medical Magazine* for November, 1899, there was published an abstract of an interesting paper by Mayo, giving the history of seven such cases operated on, with one death, the others having been cured.

LECTURE LVII
SYPHILIS OF THE STOMACH AND
INTESTINES¹

A MAJORITY of authorities on diseases of the stomach make no mention whatever of syphilis; and in truth it is not frequently encountered in practice. Perhaps it would be more correct to say that the disease is not frequently diagnosed. Every physician with a large practice doubtless meets with numerous cases, but to investigate by exact methods the gastric functions and the various diseases and disorders of the stomach has not yet become the rule, so that the true nature of these is very frequently overlooked. Syphilitic affections, even when existing, therefore, are not often recognized.

But even with the most careful scientific examinations of the stomach contents, and after testing in all the known ways the condition of the organ, it is by no means possible in many cases to decide at once whether a given affection of the stomach is syphilitic or not. When gastric disease occurs, or at least when certain gastric symptoms are present in any case in which there are undoubted syphilitic lesions in the liver or elsewhere to a marked extent, we may well suspect that it has a luetic origin; but the only decisive test which we can make then is the therapeutic one. When one sums up all that has been written by many different writers on the subject of gastric syphilis, and the modes of detecting it, it comes to about this: If the suspected gastric disease is rapidly ameliorated, and finally cured by mercury and the iodides—remedies which nearly always aggravate the ordinary gastric affections—it is

not syphilitic.

¹ appeared as the author's contribution to *Syphilis*;
E. B. Treat & Co., 1902.

It is possible that we may have a syphilitic chronic gastritis, though this is questionable. It is well established that there may be syphilitic ulcers in the stomach, and syphilitic neoplasms or infiltrations in the same viscus, involving any part of the organ, especially the pylorus. Very exceptionally, also, hemorrhage of supposed syphilitic origin, but not dependent upon ulcer, may take place in the stomach.

Syphilitic Chronic Gastritis.—There has existed considerable doubt whether pathologically the frequent cases of chronic gastritis encountered in patients who are affected with syphilis are really different from the similar forms of gastric inflammatory processes due to other causes. Most authors do not admit that gastritis can result directly from a syphilitic infection. Secondary results of the obstruction of the portal circulation caused by syphilis certainly occur in the stomach. Hemmeter and Stokes¹ have recently reported a case of chronic hypertrophic gastritis in a syphilitic patient who was operated for stenosis of the pylorus, resulting from hyperplasia as determined afterward by an autopsy. The latter showed further a marked thickening of the gastric walls in various parts by a characteristic luetic infiltration, and also a localized subhepatic abscess. The patient had been infected with syphilis two years before admission to the hospital, and had been dyspeptic before that. His symptoms, while under observation, were those of pyloric stenosis—pain or discomfort and vomiting, especially after solid food, relieved by lavage. The usual tests showed the absence of free HCl and the gastric ferments. There were numerous manifest lesions of syphilis elsewhere in his body. Hemmeter holds that “if characteristic syphilitic lesions exist in the liver, kidneys, spleen, pancreas, or intestines, the chronic gastritis should be attributed to syphilis.”² He believes further that, “in tertiary syphilis the remarkable malnutrition is due to a chronic gastritis,” which appears very

¹ J. C. Hemmeter and W. R. Stokes, *Archiv. f. Verdauungskr.*, B. VIII., Heft 4 and 5.

² J. C. Hemmeter, “Diseases of the Stomach,” second edition, p. 597, Philadelphia, 1900.

likely to be true. The former statement seems open to question. The syphilitic form may resemble closely the ordinary chronic gastritis, showing no difference pathologically any more than symptomatically, except possibly, the greater amount of small round-cell infiltration. In some cases, however, there will be found gummata, or possibly gummatous ulcers when the disease has progressed to the tertiary stage. The diagnosis, as indicated above, will turn upon the results of the treatment. If the disease yields to the usual methods of treating chronic gastritis, it is not likely to be syphilitic. When the administration of mercury and the iodides produces indigestion, aggravating the symptoms instead of bettering them, the disease is not syphilitic. On the other hand, if you chance to encounter a case in which the usual treatment by lavage, diet, etc., fails, and that by mercury and the iodides succeeds, you may conclude that you are dealing with a gastritis which has resulted either directly or indirectly from syphilis, especially if the patient should present unquestionable lesions of syphilis in any other part of the body where it can be certainly recognized. Personally, however, I doubt that a true primary syphilitic gastritis ever occurs.

Einhorn¹ believes that in the secondary stage of syphilis, "the digestive disturbances are attributable to the constitutional condition, to the fever, etc., and hence are to be regarded as concomitant phenomena of the original disease without any special involvement of the stomach," but considers the gastric affections in the tertiary stage as anatomic processes of a true syphilitic character. He further states that probably in a majority of the cases in which syphilitic persons suffer from diseases of the digestive tract, there is not "any connection between the latter and the antecedent lues."

Syphilitic Gastric Ulcer.—There can be no question as to the fact that syphilis occasionally causes gastric ulcer. Large numbers of cases have been reported in medical literature which leave no room for doubt on this point.

¹ Max Einhorn, "Prog. Med.," vol iv., 1900, p. 35.

(1) Many gastric ulcers occurring in persons who were manifestly or demonstrably syphilitic in other ways may be presumed to have been of luetic origin.

(2) These had been in most cases treated previously by the methods usually successful in relieving, if not curing, simple round ulcer of the stomach, without improvement.

(3) They respond promptly and rapidly to antisyphilitic treatment. In numbers of cases, too, *post-mortem* examinations have revealed gummata and gummatous infiltrations in the same stomachs, and in some instances the ulcers had evidently resulted from the breaking down of gummata.

Stockton¹ cites the case reported by E. Fränkel, of a man, aged 47, who died from perforative peritonitis after suffering seven years from subjective gastric symptoms, with an absence of free HCl. Thirteen ulcers were found in his stomach, besides many in the intestines, of which eighteen had perforated. The histologic examination showed the case to have been syphilis. Stockton also cites the views of Dieulafoy,² who has studied this subject somewhat exhaustively. The latter summed up his conclusions as follows:

"(1) Syphilis of the stomach is not as infrequent as might be thought.

"(2) Syphilitic lesions of the stomach occur in various forms, hemorrhagic erosions, ecchymoses of the mucous membrane, gummatous infiltrations of the submucosa, gummatous plaques, circumscribed gummata, gummatous ulcerations and their resultant scars. It is probable that here, as in other losses of substance of the stomach, the gastric juice augments this ulcerative process.

"(3) The symptoms of syphilitic ulceration of the stomach may resemble completely those of simple gastric ulcer; pains over the ensiform process, besides backache, intolerance of the stomach, vomiting of food, small and large gastric hemorrhages, melena, and marked emaciation.

¹ "Progressive Medicine," vol. iv., 1899, p. 34.

² *Bulletin Med.*, 1899, No. 40. Quoted also by Einhorn in *Phila. Med. Jour.*, of February 3, 1900.

“(4) None of these symptoms (alone) permits us to assume the syphilitic nature of the stomach lesions. As soon as the signs of a simple gastric ulcer occur in a syphilitic person, we are warranted in suspecting the syphilitic nature of the stomach lesion.

“(5) We should never, therefore, neglect to seek in a patient presenting symptoms of gastric ulcer, for a possible antecedent history of syphilis.

“(6) In the latter case an appropriate treatment with mercurial preparations and potassium iodide must be at once initiated.

“(7) The recognition of syphilis as a cause of gastric ulcer is the more important, since this enables us to cure patients who otherwise might have been subjected to surgical intervention.”

Stockton, in the same article, refers to contributions by Allen Jones and others concerning gastralgia of apparent syphilitic origin, and in view of recent developments showing the frequency of gummata, luetic infiltrations, etc., in the stomach, inclines to the belief that the gastralgia of syphilis may “more frequently depend upon a lesion than has been supposed.”

Cases of syphilitic gastric ulcer, thus, do not seem to present any particular symptoms different from those occurring in ordinary gastric ulcer. The patients have, as a rule, acute pain after taking solid food, frequently vomit the stomach contents, and in a considerable proportion of cases may present the usual signs of hemorrhage, with often perforation.

Syphilitic Ulcers of the Intestines.—Most authors make no mention whatever of a syphilitic enteritis or colitis. Among those who have written books on diseases of the intestines, without including any reference to such an affection, are Ewald, Nothnagel, Penzoldt, Boas, and Einhorn. Since, therefore, it is at least questionable whether a catarrhal inflammation in any part of the alimentary canal can be due directly to syphilitic infection, and even when suspected to have

such an origin is confessedly not to be differentiated by any histologic phenomena from the ordinary chronic catarrhal inflammation, I shall not attempt to describe to you a syphilitic enteritis.

Syphilitic ulcers do occur in the intestines, though rarely above the colon, except the congenital form in children. They are found most frequently in the rectum. Syphilitic ulcers of the colon are commonly the result of gummata which have broken down, and when luetic ulcers appear in the small intestines they oftenest arise in a similar manner; but they may also originate from ulceration of Peyer's patches, and sometimes be produced by ulceration or a specific amyloid degeneration having its seat in the intestinal mucous membrane.

The symptoms of specific intestinal ulcers, as in other forms of intestinal ulceration, may be entirely wanting, or they may give rise to pain, tenderness on pressure, and either constipation or diarrhea; blood, pus, and shreds of necrosed tissue are also discoverable at one time or another in the stools. They differ in no marked way from those of other intestinal ulcers, and the diagnosis cannot usually be made from the latter, except from the signs of syphilis elsewhere in the body and the therapeutic test.

Syphilitic Neoplasms of the Gastro-intestinal Tract.—These are often mistaken for carcinomas. They may be recognized by palpation when they have attained a sufficient size, and though they cannot be positively diagnosticated, the existence of palpable thickening or tumor in any part of the abdomen in a case presenting undoubted luetic lesions elsewhere, should at once lead to a suspicion of a syphilitic growth. The only positive means of diagnosticating between such growths, and malignant ones during life, is the therapeutic test.

When a gummatous infiltration involves the pylorus, we have superadded, of course, the usual symptoms of pyloric obstruction. That is, there will be pain and vomiting, followed later usually by dilatation of the stomach, and then by the usual signs of retention, including the vomiting, at intervals

of one to two days, of large amounts of highly offensive fermenting ingesta.

Treatment of Syphilitic Disease in the Stomach and Intestines.—No special therapeutic measures are required in these cases. They are likely to respond to any of the usual forms of antisyphilitic treatment energetically carried out. In cases of chronic gastritis in syphilitic subjects, it will be well to try a course of mercury by the mouth, or better, by inunction, or possibly even hypodermically. The ulcers, infiltrations, gummata, etc., all belong to the tertiary stage, and are best controlled, as a rule, by full doses of the iodides. It is the custom of many syphilographers, however, to employ mercury with the iodide at this stage, and the results in some stubborn cases seem to be better than when the latter is used alone.

Tertiary manifestations of syphilis may be found both in the alimentary canal of patients suffering from acquired, and those having hereditary, syphilis. The need of bearing in mind the possibility that gastric symptoms may depend upon a syphilitic lesion is clearly most important. To ignore it is to risk serious aggravation through erroneous treatment, and even the grave dangers of an unnecessary operation.

The same is true of patients showing signs of ulceration in the bowels. In all such cases exhaustive search should be made for specific reasons elsewhere, since the finding of these would insure a rapid cure usually of what would otherwise likely be very tedious cases.

LECTURE LVIII

INTESTINAL ULCERS GENERALLY—HEMORRHAGE FROM THE STOMACH AND INTESTINES

Various Forms of Intestinal Ulceration.—Authors of the most elaborate treatises upon diseases of the intestines treat of the ulcers of these parts under a dozen or more separate heads; but having devoted special lectures to tuberculous ulcers, syphilitic lesions of the gastro-intestinal tract including syphilitic ulcers, and dysenteric ulcers under the head of Dysentery, I think it will be more practical and less confusing to you if the other forms of ulceration of the intestines shall be considered here together. In this respect I shall be more nearly following the distinguished lead of Ewald, in whose recently published admirable work entitled “*Die Krankheiten des Darms und des Bauchfells*,” which has not been translated into English, all the forms of intestinal ulcers are discussed in a single lecture. Hemmeter, in considering the treatment of this subject, after referring to duodenal, syphilitic, and dysenteric ulcers, says under the head of Treatment: “All other ulcerations I can safely say will not be diagnosed except the catarrhal and tuberculous ulcers.”

Besides the varieties of intestinal ulcers already described, and to be described under the head of Dysentery, Tubercular Ulcerations, and Syphilis of the Stomach and Intestines, some mention should be made of the following, which are given in the order of their relative frequency and importance, rather than in accordance with the very elaborate classifications of Nothnagel and others:

- I. Ulcers complicating acute infectious diseases, such as the fevers, exanthems, etc.

2. Catarrhal and stercoral ulcers, that is, those occurring in the inflammatory affections of the intestinal mucosa, and from the pressure of fecal masses in constipation.

3. Toxic ulcers resulting from poisoning by alcohol, uræmia, or any of the active poisons.

4. Embolic and thrombotic ulcers.

5. Ulcers resulting from faulty constitutional states, such as gout, scurvy, and leukemia.

6. Amyloid ulcers.

The general features of these forms of intestinal ulceration I shall here take up for brief consideration in the above order.

1. *Typhoid fever, smallpox, erysipelas, diphtheria, anthrax*, and the acute septic conditions are chief among the acute infectious processes which are often complicated by ulceration in the intestine. Dysentery belongs in the same category, but this disease will claim separate consideration as belonging especially to the affections of the gastro-intestinal tract, and the ulcers peculiar to it will be therein discussed. In some of the acute infectious fevers, including especially typhoid, intestinal ulceration is frequent, and highly important, but I quite agree with Ewald in the opinion that this is not the proper place for the detailed consideration of such ulcers, since they are complications of maladies which cannot justly be classed among the diseases of the stomach and intestines. The subject is fully discussed in the standard works on the practice of medicine.

2. *Catarrhal ulcers* and those resulting from fecal accumulations are both frequent and important. Moreover they belong especially to the classes of diseases which we are studying in this series of lectures. They begin as erosions involving the superficial layers of the mucosa only, and may either directly, or by coalescing, extend over a considerable part of the bowel. When the catarrhal process or the fecal stasis persists for a long time, the ulcers thus produced are liable to erode all the layers of the intestinal walls, and even produce perforation. The catarrhal ulcers may affect any part of the bowel, but are most fre-

quently encountered in the colon. *Stercoral ulcerations* affect especially those parts where the feces are most prone to lodge, such as the cecum, the flexures of the colon, and the rectum. Like the constipation upon which they depend, they afflict particularly persons of a sedentary habit.

Both these forms of ulceration, when they involve large portions of the bowel, are liable in healing to cause contractions with resulting obstruction, and yet such a mishap seems to be uncommon.

3. *Toxic ulcers* may be caused by a great variety of irritants, and the poison may come from within or without the body. The character and pathology of them will vary somewhat with the cause—the particular kind of poison producing them. Alcohol less frequently expends its morbid influence in this than in other ways upon the tissues of the body; yet it is one of the recognized causes of intestinal ulceration. The graver cases of uræmia may be complicated by such ulcerations, but these in such serious conditions are naturally of less importance than the primary disease. Mercury in the massive doses formerly given, and sometimes still prescribed for syphilis, can easily produce intestinal ulceration of a very aggravated type. Numerous poisons, especially arsenic, antimony, etc., are capable of exciting like lesions, though their toxic effects are more commonly expended upon portions of the alimentary canal higher up, as in the esophagus and stomach.

4. *Embotic and thrombotic ulcerations* possess some clinical importance, but can scarcely be differentiated from other forms during life, except in the course of operations for surgical complications. They may arise in consequence of endocarditis, septic processes, or arteriosclerosis, and also from any of the causes capable of producing thrombosis. The emboli lead to obstruction of vessels—most frequently the smaller ones—in the mucosa, and the resulting hemorrhagic infarcts undergo necrosis with the formation of ulcers. These, according to Boas, occur oftenest between the duodenum and the cecum. The ulcers vary greatly in size; this depending upon the ex-

tent of the hemorrhage. The ulceration may be deep and lead to perforation of the peritoneal cavity. In septic embolism from ulcerative endocarditis, Boas points out especially that there may be very small embolic abscesses between the submucosa and mucosa, which open within the lumen of the bowel with the production of numerous ulcers.

5. *Gouty ulcers* are so rare that many authors deny that they ever occur, while though scorbutic ulceration involving Peyer's patches is a frequent complication of scurvy, this disease itself is becoming very uncommon, except in hand-fed infants. Intestinal ulceration has been exceptionally observed in leukemia as a consequence of infiltration of the lymphatic structures in the bowels and secondary necrosis of the same.

6. *Amyloid ulcers* of the intestines may possibly complicate amyloid disease of the liver and kidneys or other organs, but are exceedingly seldom encountered; probably never diagnosed. They may be of any size, and sometimes involve large portions of the gut, but do not cicatrize, so that obstructive contraction never results.

Symptoms of Intestinal Ulceration.—These are very similar for all the varieties of ulcers occurring in this region. As a rule, you will not be able to distinguish between them by any symptoms or physical signs, though the character of the accompanying disease, as in the case of tuberculosis or syphilis, may sometimes enable you to make the diagnosis. We can only study the symptomatology of intestinal ulceration as a whole. There are many cases which present no symptoms, and even some very mild ones in which the usual symptoms or sign of tenderness on pressure over the corresponding part of the abdomen cannot be obtained. Then again, the catarrhal inflammation which always accompanies ulcers of the intestine greatly obscures the clinical picture. Nevertheless a patient watching of the stools, and study of them microscopically as well as chemically, would rarely fail in such cases to reveal from time to time indubitable indications of the ulcerative process.

Pain of the spontaneous kind, though present at times in these cases, is quite frequently absent even when the ulcers are numerous and large, especially when there is neither severe diarrhea nor marked constipation. Pain on pressure or palpation is very much more frequently present and to be discovered by a careful search for it. Very deep pressure while the patient relaxes his abdominal muscles by flexing the knees, and keeps up slow, sighing respiration, will often reveal tenderness otherwise not to be elicited. Tenderness ascertained in this way would assist in confirming the diagnosis of ulceration in the part directly beneath the tender spot, though over the cecum it might mean a catarrhal appendix, and over any portion of the abdomen it might signify simply a catarrhal inflammation. But the tenderness over an ulcer is generally more acute.

Then, in neurasthenic patients you may often find *tender spots* over the sympathetic nerve plexuses of the abdomen, but a peculiarity of this latter tenderness is that by persistent and not too severe pressure in such places it gradually diminishes, often disappearing entirely, while the pain caused by pressure over an ulcer will usually persist and even increase as you press longer.

Constipation and Diarrhea.—One or the other of these is nearly always present in marked cases, and it is the rule, to which, however, there are many exceptions, that in cases in which there are many ulcers, especially in the lower bowel, diarrhea will be a rather persistent and troublesome symptom. But sometimes even under these circumstances constipation will exist; and exceptionally you may be misled by the bowels' continuing to act normally.

Blood, pus, and necrotic tissue are to some extent characteristic, but all of them may come from abscesses, and pus, if present in large amount, would point decidedly to the latter. Mucus alone might well signify nothing more than catarrh. Blood may arise from various congestive conditions, but in large quantity nearly always signifies the erosion of a vessel

by ulceration in some part of the gastro-intestinal tract. When it is fresh, and of a bright red color, it has generally come from some place in the rectum or colon, though when the peristalsis is unusually active, as in diarrhea, you should not forget that blood originating in the small intestine, and, very exceptionally, even in the stomach or esophagus, may pass the anus without having undergone any marked change. Usually the more altered the blood is, and the more intimately intermingled blood or pus or necrotic tissue is with the feces, the higher up in the tract it has originated.

Tubercle bacilli in the feces are not necessarily significant of tubercular ulceration, unless found at a time when the patient is not having any sputa or are present constantly in large numbers; and on the other hand, the failure to find the bacilli at a single examination would not prove that tuberculosis was not present, and that the ulcers were catarrhal or of any non-tubercular origin.

Fever indicates nothing in regard to intestinal ulceration, since it can proceed from so many other causes.

The general condition of the patient may or may not be so much affected by intestinal ulceration as to awaken a suspicion of its existence. As a rule in those ulcers, for example, which are likely to develop in chronic intestinal catarrh, you will nearly always find a marked lowering of the general health, but this very often results from the catarrhal inflammation alone, before the ulceration has developed. Very exceptionally the flesh, strength, and color may remain about as in health, in spite of both the catarrh and ulceration. In the other form of intestinal ulcers also, the general state would depend chiefly upon the primary disease and the extent to which it had reduced the patient.

Diagnosis.—As previously intimated, it will often be extremely difficult, or even impossible, to differentiate between the different varieties of intestinal ulcers except when it is practicable by the symptoms of the primary disease, or the clinical picture as a whole, to make the diagnosis. Even to determine

positively, in certain of the less pronounced cases, that ulcers of the intestines exist is by no means easy. When blood passes the anus in either small or large amounts, and at the same time, small, or very moderate amounts of pus and necrotic tissue are found frequently in the stools without the existence of fever and the other signs of abscess, you may well suspect the presence of ulceration, especially if you can also find circumscribed spots over portions of the intestines which are painful on pressure. Then the coexistence of a disease, such as dysentery, typhoid fever, or a long-standing enteritis or colitis, would greatly increase the probability of ulcer, and, in fact, in most cases suffice to determine the diagnosis positively.

Treatment.—As in the case of the diagnosis, so the treatment of ulcers of the bowels must depend in large measure upon the character and requirements of the primary disease. In the ulceration, for example, which so often occurs as a complication of typhoid fever, you will insist upon the most absolute rest for the patient, the blandest possible diet, and then prevent peristalsis by a bold employment of opium and astringents with the help of ice-bags locally, knowing that it is a temporary matter, and that with the subsidence of the fever, the hemorrhage, as well as the ulceration which causes it, will speedily cease. In the ulcers from embolism or thrombosis, you will devote yourself to the task of curing the endocarditis, septicæmia or other disease upon which it depends, with the addition of any needed local measures to control hemorrhage or pain.

In the *catarrhal or follicular form of ulcers* the problem will be somewhat different, and here you will need to rely largely upon the local measures of treatment in addition to the general mode of therapeusis, dietetic and otherwise, which is required for the intestinal catarrh. Full directions on this head will be found in Lecture LXVI. devoted to that subject; and indeed, the methods of applying antiseptics and astringents by the rectum for the cure of intestinal catarrh, will prove, in the

main, the most efficient for the ulceration. Ewald refers to the difficulties usually encountered here on account of the extreme irritability which the intestinal mucosa often manifests, and recommends suppositories of cocaine to overcome it. I have found 3-grain or 5-grain suppositories of ichthyol, inserted in the rectum once or twice a day, to answer this purpose admirably, and at the same time to aid much in disinfecting and healing the lesions. The infusion of slippery elm recommended by Turck of Chicago, as a menstruum for medicaments in chronic catarrh of the colon, is still more helpful by its demulcent influence in these cases. A large and free use should be made of bismuth, and every effort be made to have an emulsion of it with slippery-elm infusion introduced high enough up into the bowel to reach any ulcers that may be in the cecum or ascending colon, which can be accomplished usually by position, as advised by Turck, or in some cases, better by the use of a long and semi-flexible rubber tube.

Ewald strongly advises the injection of a 0.2 per cent. to 0.3 per cent. solution of nitrate of silver, and I have seen excellent results from the introduction every other night of a solution of carbolic acid and Listerine, according to the formula given in Lecture LXVI. on Chronic Catarrh of the Intestines.

In all these cases, whether the prevailing condition of the bowels seemed to be one of constipation or diarrhea, I have noticed favorable effects, as a rule, from the administration every day or two of a small dose of castor oil, or some other equally gently acting and effective laxative. Even when there are loose stools passing daily, there are often hard fecal masses lodged in the flexures or other stagnant pouches of the colon, and not until these are removed and prevented from re-accumulating, will the catarrhal, and still less the ulcerative, process take on a healthy reparative action.

I have at times administered the more highly refined preparations of petroleum such as vaselin, albolene, etc., pleasantly flavored, and been pleased with their results upon the bowels

in such cases as are now under consideration, and more frequently still in cases of simple constipation from chronic intestinal catarrh. One or two teaspoonfuls of vaselin at bedtime would often overcome the constipation in the most gentle and satisfactory way, and at the same time exercise apparently a soothing and healing effect upon the lesion in the mucosa. But in persons with any cardiac weakness, I soon noticed that the circulation was depressed by the remedy, and as many of the patients afflicted with these troubles have at the same time weak hearts, I was obliged to abandon the use of it. Quite recently I have been prescribing a still more highly refined preparation of the kind called Purpetrol, said to be made from a Russian petroleum, and find it effective in doses of about 1-2 an ounce, given once or twice a day on an empty stomach. So far, I have not noticed any marked cardiac depression from its use, though should be watchful as to this in the case of any patients having a particularly weak heart. Its influence is very bland and soothing and the stool results without griping, as a rule, but it is truth to say that it is in no sense an active purgative, and in persons who are at all obstinately constipated, needs to be supplemented by some more decided aperient. The valuable feature of such a mineral oil is, that it is absolutely non-irritating to the whole digestive tract, which is a great desideratum.

Olive oil or cotton-seed oil, which in doses of $\mathfrak{z}\text{i}$ to $\mathfrak{z}\text{vi}$, introduced at bedtime by enema and retained till morning, is so highly effective in overcoming the constipation of chronic intestinal catarrh and muco-membranous colitis, may fail, or prove wholly unsuitable in cases of intestinal ulcers, especially when these are in the colon, because of its slightly disturbing effect. Even when combined with full doses of bismuth, as I have been accustomed to direct in certain cases of the former ailments, it is by no means sure not to disagree in the presence of complicating ulcers affecting the lower colon.

Since the treatment of syphilitic, dysenteric, and tuberculous ulcers of the intestines is sufficiently discussed in the lectures

devoted to those subjects, I need not take up here the treatment of those special forms of ulceration.

HEMORRHAGE FROM THE STOMACH AND INTESTINES

In various lectures of this series I have considered the more frequent causes of hemorrhage from the gastro-intestinal tract, such as round ulcer of the stomach or duodenum, cancer, syphilitic, tubercular, dysenteric, and simple catarrhal ulceration of the tract, and also the rare possibility of hemorrhage from benign polypoid growths in either the stomach or intestines.

In Lecture XV. under the title of A Symptomatic Guide to Diagnosis, practically all the known conditions which are capable of causing blood to appear in either the vomit or the stools are catalogued, so that those not fully considered elsewhere in this book can easily be looked up in other works in which the causative diseases or disorders are discussed.

But, besides the gastro-intestinal causes of hemorrhage, there are some others of sufficient importance and frequency to merit special mention here. Then there are the cases in which the hemorrhage is from the respiratory tract, mouth, pharynx or gullet, the blood appearing either in the vomit or stools, and a hurried résumé of all the possible causes of the appearance of blood in either the vomit or stools may be of assistance to you.

For our purposes the appearance of blood in either may be divided into the following five classes:

1. Small quantity of either fresh or changed blood vomited with usually no signs of blood in the stools.
2. Moderate or large quantity of blood vomited and usually altered blood resembling coffee-grounds, with possibly some clotted fresh blood in the stools.
3. Small amount of bright or dark-red blood in the stools, but none in the vomit.
4. Altered blood in the stools with usually none in the vomit.

5. Large or small amounts of blood in the stools, some of it often of dark red color, and some of it brownish and altered, with usually blood or altered blood also in the vomit.

The Significance of Blood in Vomit or Stools.—1. The vomiting of small amounts of blood is more likely to signify cancer than ulcer or any other disease, but may result from an ulcer in the mouth, pharynx or nasopharynx, esophagus, stomach, or even the duodenum. It may proceed from the gums, the socket of a recently extracted tooth, or from any other trifling injury in the mouth or the mucous tracts opening into it. What has been called vicarious menstruation, but is probably really a leakage from a congested gastric mucosa aggravated, as all digestive troubles are prone to be at the menstrual period, may be responsible for the presence of either small or large quantities of blood in the vomit. So, also, may erosions of the stomach, and hepatic cirrhosis, heart disease with failing compensation, or any other cause of passive congestion in the portal vessels. The unskillful use of the stomach tube may possibly provoke small bleedings from a hyperæmic gastric mucosa, and in such cases I have sometimes seen a few drops tinge the wash water during the lavage, even when the tube was introduced with the utmost possible gentleness and the patient had not struggled or had spasmodic contractions of the gastric musculature to produce an injury of the membrane. In any such case it is generally advisable to intermit the use of the tube for a week or two and administer a pill of nitrate of silver and bismuth to lessen the congestion.

As a rule, in the smaller hemorrhages from the stomach, the vomited blood is changed in character by digestion and is of a dark brownish color resembling coffee-grounds. It is rare for small amounts of blood to be vomited in the fresh state, unless when the stomach is exceedingly irritable, so that emesis is occurring almost constantly. Then much, too, depends upon the activity of the peptic digestion. When a normal proportion of pepsin and HCl is secreted, a small amount of blood leaking out into the viscus is very rapidly changed by digestion so that,

in even half an hour, it would no longer appear as blood, whereas, with a very deficient secretion of HCl and the ferments, the blood is changed more slowly, and after a copious hemorrhage, even with a very active digestion, vomiting is commonly provoked more speedily and much of the blood may then come up in an unchanged form.

Blood may be vomited, or at least tinge the vomitus, in any of the severer forms of anæmia, or in purpura, scurvy, or in other constitutional affections which greatly alter its crasis.

The Source of the Larger Gastric Hemorrhages.—2. A relatively large hemorrhage is more likely to have come from a peptic ulcer in the lower end of the esophagus, from the stomach itself (most frequently) or from the duodenum, than from cancer or any other cause, though you should not forget that in either cancer or ulcer, either large or small amounts of blood may be vomited, and that such blood may be bright and red or dark and partly digested, whatever the cause of the hemorrhage may have been.

A moderately large hemorrhage, or small hemorrhages from the stomach may result from any of the conditions mentioned above as causes, except that in the cases of slight injuries in the mouth or its vicinity, or irritation of the gastric mucosa from the use of the tube, there is very rarely any considerable loss of blood unless the tube should perforate an ulcer.

The most profuse and dangerous hemorrhages from the stomach arise from the eroding of a blood-vessel of considerable size by the extension of a peptic ulcer, or less frequently from the ulceration of a cancer. A large amount of blood, often of a bright red color, may be vomited when its source has been the rupture of a vessel in a tubercular cavity of the lungs. It is possible, too, though less common, to have a small quantity of blood swallowed and afterward vomited in altered form, during, or subsequent to, a pulmonary hemorrhage. In such a case the blood would almost certainly be digested and changed to a dark brown color, except when the gastric juice was very deficient.

Less Frequent Causes of Hematemesis.—Other much less frequent causes of hematemesis, which is then usually rather copious, are aneurisms of the esophageal or gastric arteries or varices of the veins in the same parts, and erosions of the vessels in the same by the action of strong acids or other irritant poisons or foreign bodies swallowed. Very hot ingesta are also said to have caused the vomiting of blood, and the amount lost would be large in case a vessel should be thus eroded.

Moderate hemorrhages occasionally result also from the congestion of the gastric mucosa, or are due to changes in the blood itself, incident to the course of severe cases of the acute infectious diseases, especially yellow fever, acute yellow atrophy of the liver, cholera, and in the severer forms of malarial fevers; also in typhoid fever, relapsing fever, smallpox, typhus fever, scarlatina, and exceptionally even in measles.

Other causes of considerable gastric hemorrhages mentioned by authors are melena neonatorum, nephritis, and so-called idiopathic gastric hemorrhage, but in all these cases the cause, it seems to me, can be traced to one of the conditions already described above. The exceedingly rare instances of blood vomited in nephritis have been shown to be dependent upon miliary aneurisms in the gastric mucus membrane due, as all aneurisms are, to an atheromatous condition of the vessels. The loss of blood in the new-born through the stomach and intestines is of unknown origin, but apparently the cause is a depraved state of the blood itself.

The Source of Blood Found in the Stools.—3. Fresh blood in the stools, with none in the vomit, comes most commonly from hemorrhoids or ulcers in the rectum or lower colon; but a cancer or even polypi, in the same region, may also give rise to such bleedings.

4. Altered blood in the stools, with usually none in the vomit, point to ulcer, cancer, or rarely to polypi or other innocent form of tumor rather high up in the bowel—in the cecum, ascending colon, hepatic flexure, or ileum most frequently.

It may also be due to any of the forms of intestinal ulcera-

tion already described in this and the preceding lectures, or to such acute infectious diseases as typhoid fever, etc.

Blood in Both Vomit and Stools.—5. There has generally been a copious hemorrhage in either the stomach or duodenum—except in the case of hemoptysis with a large portion of the blood swallowed—when you find blood both in the vomit and stools in considerable quantities, whether all of that in the stools be dark and altered, or a part of it is still recognizable as blood. The most frequent cause of such a large hemorrhage is an eroded vessel as a result of either ulcer or cancer—more frequently the former—in the stomach or duodenum.

Symptoms.—Small bleedings may occur in the stomach or bowels without symptoms other than the appearance of blood, either fresh or altered by digestion, in the vomit or stools as above described. But a large hemorrhage, besides nearly always revealing itself by hematemesis as well as by bloody stools, will necessarily produce a feeling of weakness, faintness, or even collapse with unconsciousness, and sometimes convulsions.

The face and mucous membranes will also become pale, and fever generally develops after a copious hemorrhage. When the blood comes from an artery and is vomited very soon, it may be bright; but when from a vein it will be darker, and in either case, if long retained in the stomach, or even if retained a comparatively short time when there is an abundance of HCl and pepsin, it may be completely changed by digestion and present the brownish appearance of coffee-grounds. In very serious forms of hematemesis, blindness or other disturbances of vision have exceptionally been noted.

Diagnosis.—You will not usually have much difficulty in recognizing fresh blood by its naked-eye appearance, especially if present in much quantity. When the amount is very small, you can identify it by recognizing the blood corpuscles under the microscope. Or the Van Deen test, as modified by Weber, may be employed.

The Weber-Van Deen method is thus carried out:

Take a small quantity of the filtered stomach contents and mix with water. Then add one-third as much glacial acetic acid. After settling, pour off 10 c. c. of the mixture and then add 10 gtt. of tr. guaici and 20 to 30 gtt. of turpentine. The mixture will turn a violet blue when blood is present; if not, it will turn a reddish brown, with frequently a greenish tinge. The patient should not have eaten either raw or partly cooked meat shortly before. This test cannot be depended upon to determine whether there is an admixture of altered blood in vomit or stools.

The safest test for the recognition of small amounts of changed blood is, next to a spectroscopic examination, the examination microscopically for hemin crystals. This is thus done:

Examination for Hemin Crystals.—Prepare a slide of the stomach contents or feces to which a little common salt has been added. Then let a drop of glacial acetic acid run under the cover glass in such a way as to mix with the material to be examined. Now heat the specimen over a Bunsen burner to a point just short of boiling—that is, till bubbles begin to form. On cooling the slide you may see under the microscope, with a low power, the hemin or Teichmann's crystals as elongated rhombic prisms of dark brown or black color. When this test gives a positive result, you may be certain that blood is present, but it may sometimes fail, even when there is blood in the mixture examined. In any important case, when the foregoing method fails to show blood, you should make the test for iron. This test is thus carried out:

The Iron Test for Blood.—Place in a small porcelain dish a little of the blackish sediment from the stomach contents or feces. To this add a small amount—a few crystals will answer—of chlorate of potassium, as well as one or two drops of concentrated HCl, and heat slowly over a flame. If necessary add enough more HCl to make the dark color of the sediment entirely disappear. When all the chlorate has dissolved, add a few drops—1 to 2—of a 5 per cent. solution of po-

tassium ferrocyanide. If iron be present, the pronounced blue color of Prussian blue will develop. This is a very trustworthy test provided the patient has not been taking iron as a medicine, nor recently eaten raw or rare meat, which could give the same reaction.

Blood from the stomach and that from the lungs or upper air passages.—In Lecture LIII. I have given the chief diagnostic differences between blood proceeding from the lungs or other parts above the stomach and from that viscus itself. In some cases this point cannot be positively determined, but nearly always a careful examination of the mouth, nose, and throat will enable you to exclude blood from those parts, and the existence or non-existence of phthisis can generally be positively decided. When there is known to be a cancer or ulcer in the stomach, any blood in the vomit or stools can usually be safely decided to have come from the stomach itself. When, however, a tubercular involvement of the lungs has been diagnosed, and there is, at the same time, a gastric ulcer or a congested condition of the gastric mucosa, vomited blood might possibly have come from either, though usually the fact of a preceding hemoptysis would be known, and then the probability would be that the blood originated in the lung. The finding of tubercular bacilli in the ejecta would be decisive, as a rule.

Treatment.—In Lectures LIV. and LXII. in connection with the treatment of ulcer and cancer of the stomach, I have considered the principal remedies for gastric hemorrhage, whatever its immediate cause.

The administration of remedies by the mouth is rarely efficient, and in very acute cases, even the swallowing of ice pellets may do more harm than good. The administration of suprarenal extract or adrenalin 20 to 30 gtt. of 1-1000 solution, either on the tongue or hypodermically, should prove efficient. When it is necessary to employ more heroic measures, ergotin or ergotol may be injected hypodermically, or when excessive hemorrhage has produced serious exhaustion, the normal salt solution may be introduced in small quantities by enema every

hour or two, or subcutaneously by attaching a rubber tube to a large-sized hypodermic needle.

In nearly all cases, however, the enforcement of complete rest of the body by keeping the patient strictly in bed with no food, drink, or medicine allowed to be taken by the mouth, will speedily control even very threatening gastric hemorrhage without further treatment. A hot, wet compress over the epigastrium will help to allay the congestion within, and the cautious administration of aconite hypodermically or per rectum, to lessen arterial pressure, may also prove of marked advantage in cases having a strong, bounding pulse.

For intestinal hemorrhage, in addition to the general measures above advised, ergotin hypodermically, adrenalin on the tongue, and gallic acid by the mouth or rectum in 5- to 20-grn. doses three or four times a day, are often effective.

LECTURE LIX

CARCINOMA AND OTHER TUMORS OF
THE STOMACH

IN considering the very large subject of cancer of the stomach, I shall limit myself to its more practical aspects, summing up and placing as plainly before you as possible the well-established facts that will be of use at the bedside, or in the consulting room. The minuter pathology, including the histology of the morbid processes, and the still unsettled questions regarding the ætiology of the disease, are all discussed at length in treatises which are accessible to you.

Nearly one-half of all cancers, according to Riegel, involve the stomach. The disease in this location may be of the hard or soft kind. The former (scirrhus) comprises 72 per cent. of all cases. Soft cancers may be either adenocarcinomas or of the medullary variety, and both may undergo colloid or gelatinous transformation. A majority of gastric cancers involve the pylorus. Lebert gives the relative localization of the disease as follows:

Pylorus, 51 per cent. ; lesser curvature, 16 per cent. ; cardia, 9 per cent. ; anterior wall, 3 per cent. ; posterior wall, 4 per cent. ; anterior and posterior walls, 4 per cent. ; greater curvature, 4 per cent. ; diffuse infiltration, 6 per cent.

Frequency and Incidence of the Disease.—One per cent. of all deaths result from gastric cancer. It is greatly less frequent than nervous dyspepsia, the various forms of gastric catarrh, displacements, and atonic dilatations of the stomach, and derangements of secretion, and much less frequent even than gastric ulcer. As a rule, cancer of the stomach, like the same disease elsewhere, does not often occur before middle age, being

very rare under thirty; yet it is important for you to bear in mind that exceptional cases have been encountered in children, and even in infancy, so that there is always the remote possibility that a doubtful tumor, even in the young, may be malignant. The two sexes are about equally subject to this disease.

As to its ætiology, not much can yet be said with certainty. Heredity, however, has been shown to have some effect—*i. e.*, the tendency to it is often inherited—and traumatisms or irritations frequently seem to exert a causative influence. There is also quite a fund of testimony to the effect that cancer of the stomach, more often than not, affects persons who have not been subject to indigestion; yet my own experience shows that life-long dyspeptics are by no means exempt from it. Gastric ulcer sometimes stands in an ætiologic relation to cancer, as was stated in one of the lectures on the former disease.

The Varieties of Cancer which may affect the stomach are:

1. Medullary carcinoma. 2. Scirrhus cancer. 3. Adenocarcinoma, or destructive adenoma. 4. Colloid or gelatinous cancer. 5. Squamous epithelial cancer.

Scirrhus is the form most frequently encountered in the stomach, comprising, according to Brinton, 72 per cent. of all gastric cancers.

Pathology.—1. *Medullary or soft cancer* involves the gastric glands, and while rich in cells (cancer nests), it is poor in stroma. It is the predominance of cells over the connective tissue that imparts to this form of cancer its soft structure. It usually occurs as a soft fungus or rounded swelling about the pylorus. As the tumor grows, the blood supply becomes lessened, the nutrition impaired, and the central portions of the growth become softened and undergo necrosis. This gives rise to the formation of large ulcers with raised borders, which distinguish them from peptic ulcers. The floor of the ulcer is, as a rule, indurated and infiltrated with round cells. Hemorrhages are common in this form of cancer, and metastases are numerous. It often happens that, owing to destruction of the cell-nests and proliferation of the connective tissue stroma, a

soft cancer becomes hard and shrunken, thus changing into a scirrhus cancer.

2. *A scirrhus cancer* is made up of a relatively small number of cells and a large amount of connective tissue stroma. It appears in the form of a diffuse thickening of all the layers of the stomach wall. It involves more especially the pylorus, which then becomes obstructed, giving rise to dilatation. There



FIG. 75.—Cancer of the posterior wall of the stomach. (From Sidney Martin's "Diseases of the Stomach.")

is a general fibrous hyperplasia. The mucous membrane is thickened, and the submucosa and muscularis particularly indurated. This form of cancer is with difficulty diagnosed from inflammatory thickening or sarcoma.

In scirrhus of the body of the stomach the viscus may be greatly contracted, but when it involves especially the pylorus, stenosis and dilatation occur.

3. *Adenocarcinoma* arises in mucous membranes covered with cylindric epithelium. In this form of cancer the glandular epithelium proliferates, forming tubular gland-like structures. In the stomach it forms soft nodular growths, which

eventually break down and ulcerate. The stroma is scanty and infiltrated with leucocytes. The base of the ulcerated growth is almost always indurated and thickened by fibrous hyperplasia.

4. Colloid cancer, or as it is sometimes called, alveolar cancer, consists essentially of an infiltration of the neoplasm with



FIG. 76.—Diffuse cancer of the stomach, (From Sidney Martin's "Diseases of the Stomach.")

a colloid substance (pseudo-mucin). The growth forms nodular swellings or a diffuse wide-spread infiltration. It involves all the coats of the stomach, and frequently spreads to the peritoneum and neighboring organs. Ulceration is uncommon. This form of cancer usually occurs in young persons.

5. *Squamous epithelioma* is rare in the stomach. When it does occur, it affects the cardiac end and the neighboring parts of the esophagus.

The secondary pathologic manifestations in gastric cancer

include the cachexia and metastases. The cachexia is brought about by the disturbed nutrition due to inanition, as well as by the toxic products of the cancer itself. It is noteworthy that Adamkevitch isolated from the cancer juice a toxic ptomain, cancroin, identical with cadaverin.

The metastases involve the lymphatic glands, and other organs, especially the liver. The metastatic growths are identical with the primary.

The blood in gastric cancer is greatly impoverished, the number of red blood corpuscles being reduced in advanced cases to 1,500,000 per c.mm. The red corpuscles show distortions—poikilocytosis—characteristic of pernicious anæmia. The leucocytes are increased to 10-50,000 per c.mm., and the normal hyperleucocytosis which occurs after digestion is as a rule absent. The hemoglobin is decreased in proportion to the anæmia.

Complications, Sequels, etc.—Gastric cancer involving the orifices causes organic changes in them usually of an obstructive character, or less frequently by a process of infiltration stiffens them (or the pylorus at least) in such a manner that the muscular fibers are no longer able to contract, and the pylorus remains constantly open thereafter until the patient's death. I have seen no mention of a like process in the cardia, though it doubtless occurs exceptionally.

Cancerous stenosis of the pylorus produces dilatation of the stomach, which often attains finally an enormous size, filling in some instances nearly the entire abdominal cavity. This results in the peculiar periodic vomiting described further on, of very large quantities of offensive, decomposing ingesta.

Obstruction of the cardia by a cancerous growth, or obstruction in like manner of the esophagus, produces a gradual contraction of the stomach until at death the latter may hold a few ounces only.

Diffuse scirrhus of the gastric walls may also cause a similar contraction.

An unyielding non-contractile condition of the circular mus-

cular fibers of the pylorus, due to a cancerous infiltration with the result that it cannot close, produces, as a rule, no noteworthy anatomic changes elsewhere in the viscus, but aggravates the impairment of nutrition by allowing a reflux into the stomach of bile and other contents of the small intestine, including not infrequently feces.

Hour-glass contraction of the stomach has been noted in a few instances as a result of cancer.

Distortions of the stomach occur very often in consequence of the cancerous process having involved the peritoneal layer with the development of local inflammation which produces adhesions to adjacent organs. There may exceptionally be perforation into the peritoneal cavity, the pleural cavity, or even the pericardium.

Tetany, which is referred to in Lecture XXXVII., is a rare complication of cancer of the stomach.

Dropsy is a not uncommon late development, and coma, closely similar in all respects to diabetic coma, may usher in the final stage of the disease.

Gastrocolic Fistula is scarcely mentioned by most authors, but is an occasional noteworthy complication of gastric cancer. This condition, though rare, is one of extreme seriousness, and it thus becomes important to recognize it early so that a correct prognosis may be given, and in certain instances, remedial operation be resorted to.

Ætiology.—Gastrocolic fistula occurs most frequently as a complication of gastric cancer, but may complicate gastric ulcer or rarely cancer of the colon. The most frequent cause next to cancer is ulcer of the stomach. Of the remaining causes, mention should be made of double perforation of an abscess, and the congenital existence of the condition which is, however, questionable.

Symptoms.—At the time of the perforation the patient may complain of acute pain, but more frequently experiences the sensation of something having given way. This may be followed by prostration, and even collapse, as well as the appear-

ance in the vomit of red blood and shreds of tissue, the whole resembling the vomitus after a recent attack of hematemesis.

The symptoms vary much in different cases. There may occur, for instance, cases of such a fistula which do not exhibit any positive clinical evidence of the lesion. Such cases are of interest chiefly to the pathologist. Then you will encounter cases in which fecal vomiting is a pronounced symptom. You will need to depend then upon the concomitant symptoms to make a correct diagnosis.

Roughly speaking, fecal vomiting occurs in a fraction over one-half the cases observed. Its existence is not in any respect diagnostic of gastrocolic fistula, since it has been reported in a number of cases of pyloric cancer in which the pylorus was permanently patulous, being unable to contract; also in hysteria, intestinal obstruction, and some other conditions. But in the absence of evidence of any of the above mentioned affections, fecal vomiting should lead you to think at once of the complication now under consideration.

It comes on quite suddenly, as a rule, when due to gastrocolic fistula, its feculent character becoming at once noticeable. The offensive feculent odor, the brownish color, and at times the presence of well-formed feces from the lower bowel make positive the nature of the vomit whenever the characteristic appearances are present. In such cases the breath is likely to have constantly a fecal odor.

There usually results, also, a persistent and troublesome lien-teric diarrhea, the patient passing at stool, soon after eating, large quantities of partially or wholly undigested food. Thus the rapid passage of the food undigested into the lower bowel brings about a consequent rapid and marked emaciation, which is often out of all proportion to the possible effect of the existing carcinoma. The patient, as Bouveret states, practically vomits persistently into the larger bowel. This happens especially when there is a sudden cessation of the usual upward vomiting, the diarrhea developing generally a short time afterward.

Substances introduced into the rectum may sometimes be found in the vomit a very short time later. After lavage of the stomach it may be noted that a more than usual decrease has taken place in the amount of fluid recovered, as compared with the amount introduced. This is out of all proportion to the loss of liquid after washing out a non-perforated stomach. Then the patient experiences soon afterward a desire to evacuate the bowel.

Inflation of the stomach may cause a secondary prominence over the colon, although this result has not, as a rule, proved so striking as when the air is introduced by way of the lower bowel. In the latter case, the sigmoid, and at times the transverse colon may become sufficiently distended to be recognizable. After such a distention the air will rapidly enter the stomach and be followed by marked eructations of gas from the patient's mouth.

In a case reported by Edsall and Fife¹ the patient presented many symptoms of gastrocolic fistula, such as the presence of cancer and persistent feculent vomiting especially, and the vomitus contained shreds of tissue. Inflation of the lower bowel resulted in a marked belching of a foul gas, in considerable quantities, with a consequent subsidence of the distention. A large percentage of fat appeared in the vomit while the patient was receiving enemas of milk and eggs.

The autopsy, however, showed the pylorus to be infiltrated with cancer which had converted it into a firm non-contracting patulous tube. No fistula was to be found.

Symptomatology of Gastric Carcinoma.—Cancer of the stomach usually begins with the symptoms of chronic gastric catarrh, mildly and often very insidiously. It is quite impossible to make the diagnosis at first. When, however, a person of middle age or beyond, who has not previously suffered from indigestion, begins, without any particular fault in diet, to complain of slight discomfort after eating, with gaseous eructations, falling off in appetite, especially for meats and fats, and

¹ *Am. Med.*, October 10, 1903, p. 584.

loss of strength, these symptoms persisting and becoming gradually and often rapidly worse, in spite of appropriate treatment, you may suspect carcinoma. If, then, the usual tests should show a diminished percentage of HCl, and still more if there should be found constantly a failure of free HCl and the presence of much lactic acid during the period of digestion, together with a progressive impairment of motor power in the stomach walls, with or without the development of cachexia, the likelihood of a malignant process would be considerable.

The above-named symptoms, even with nausea, copious vomiting, and pain in the stomach added, would not be conclusive as to the existence of carcinoma, since chronic asthenic or atrophic catarrh, with dilatation from myasthenia or from any of the benign forms of obstruction of the pylorus, might account for all of them. If, however, in addition to such a group of symptoms growing worse in spite of good treatment, there should appear vomitings of blood, or coffee-ground matter in either the vomit or stools, and the pain should increase and become fairly constant without regard to the digestive periods, especially if lactic acid should be found in the proportion of 1 to 1000, with or without the Boas-Oppler bacilli, there would be sufficient cause for venturing the diagnosis of probable cancer, and advising an exploratory incision, even before a tumor could be recognized.

But you will rarely find all these typical symptoms in any one case—at all events rarely before a tumor has become manifest. Even when all or most of them are present, there is by no means always the typical progressive downward course. Under suitable treatment, there are often short periods of improvement which tend to awaken false hopes and sometimes shake the faith of even the doctor himself as to the correctness of his own diagnosis. The pain may be referred to any part of the region usually occupied by the stomach, or far below the navel, as the organ, by dilatation or displacement, not infrequently extends into the pelvis. It may radiate to either hypochondrium or to the back, and may be felt in the left shoulder,

especially when the cardia is involved. It is generally dull, though there may be acute exacerbations. Its most marked peculiarity is its relative constancy, as compared with the intermittent pains of other gastric diseases.

Vomiting is an extremely frequent symptom, and when, as is most usual, the growth causes pyloric obstruction, with resulting dilatation and stagnation, it is peculiar and characteristic. The vomiting is then apt to come on every second or third day, when large amounts of undigested and partly decomposed gastric contents will be brought up, in which there may be yeast germs, the Boas-Oppler bacilli, changed blood and possibly pus, as well as much mucus, but rarely sarcinæ. Fever is included by some writers among the symptoms of gastric cancer, but is only exceptionally present and then usually toward the end of the disease, though in one series of six cases of carcinoma in persons between twenty and thirty years old, fever was present in three. Constipation, another alleged symptom of cancer, is often replaced by diarrhea, and it prevails also in most other diseases of the stomach. Anorexia, debility, and emaciation all develop more uniformly and rapidly, as a rule, than in other gastric affections, and cachexia shows itself certainly at some stage, though not often to a marked extent, long before a tumor can be recognized.

The most constant signs of the disease during the first six months, or before a tumor can be felt, are a peculiarly dirty tongue, failing flesh, strength, and color, and, when the growth involves the pylorus, the evidences of gastric dilatation, including a splashing sound obtained by tapping over the stomach, or, when this fails, by detecting the splash of the retained gastric contents by palpation, while the patient is caused to contract the diaphragm by his own efforts. Such a splash, either heard or felt over the region occupied by the organ, signifies weakened stomach walls, as well as the presence at once of liquid and gas produced by fermentation; when heard or felt below the umbilicus, it means that, whether there be cancer or not, there exists a dilatation or displacement of the stomach,

if the other signs show that the latter extends that far. Neither of these signs is diagnostic, since both are often recognized in chronic gastric catarrh associated with other forms of dilatation, and the splash may be elicited in merely atonic or displaced stomachs.

We know, also, that the absence of free HCl, and even the presence of a considerable proportion of lactic acid, are not pathognomonic of carcinoma, though lactic acid, in the proportion of 1 to 1000 or above, when the test breakfast has been given as directed by Boas, consisting of oatmeal or barley gruel without milk or cream, and preceded the evening before by a thorough lavage, affords strong presumptive evidence of cancer, being only very exceptionally found in other conditions, such as aggravated cases of asthenic gastric catarrh, with great stagnation of the stomach contents.

But the absence of free HCl of itself need not even raise a suspicion of cancer. Samples of stomach contents without free HCl are examined almost daily in my laboratory from patients with various non-malignant troubles, especially asthenic and atrophic catarrhs and some of the neuroses of the stomach. On the other hand, the presence of a full or normal percentage of free HCl does not wholly preclude the existence of cancer, especially that form which arises in the site of an ulcer. This, though, is not very frequent.

Those of you who are expert with the microscope will, of course, in suspected cases, study the sediment of the wash water after lavage to ascertain especially whether there are present fragments which show the cancer cells or the histologic structure peculiar to carcinoma, or the Boas-Oppler bacilli. The former probably constitute the most certain of the earlier signs of gastric carcinoma, though failure to find them by no means excludes the possibility of malignancy.

Hemmeter reports having obtained positive evidences of the existence of a malignant growth in the stomach from the peculiar character and arrangement of the cells, one to three months before a tumor could be felt. His method in suspected

cases is to feed by the rectum exclusively for forty-eight hours, then wash out the stomach with the normal salt solution, using for this purpose a soft rubber tube provided with edges of unusual firmness around the lower opening, so as to facilitate the dislodgment of fragments of the tumor. To find such fragments the wash water is allowed to settle for six hours in a conical glass, or the sediment may be rapidly brought down by the centrifuge.

As to the Boas-Oppler bacilli, while their presence would not alone warrant a positive diagnosis of cancer, or their absence exclude it, they constitute one of the most valuable confirmatory signs, especially when they

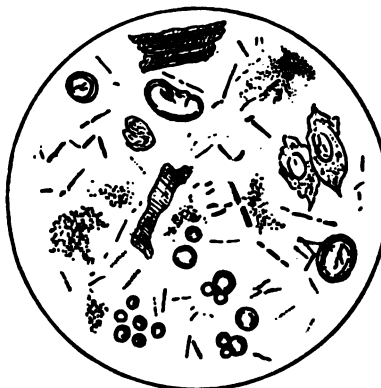


FIG. 77.—Boas-Oppler bacilli.

are very plentiful. They are long, filiform, and non-motile bacilli, which have the power of abundantly forming lactic acid from sugar. (See accompanying illustration, Fig. 77.)

In the terminal stage of gastric cancer, there is likely to be, along with extreme emaciation and prostration, dropsy of the extremities, and coma,—the *coma carcinomatosum*.

Symptoms of Cancer as Affected by its Location.—The foregoing account of the symptoms applies especially to the most prevalent forms of gastric cancer, in which the growth has originated in or near the pylorus, where it sooner or later obstructs the onward passage of the food into the bowel. In these cases the tumor at first, before dilatation has taken place, occupies a position just to the right of the middle line, where it is covered by the liver, except when there has been previously an enlargement or downward displacement of the organ. It is always difficult, and often impossible, to palpate the tumor in this position, but later, when the inevitable dilatation has re-

sulted, it appears below the liver and is more easily within reach of the examining fingers, except when the stomach is adherent to the left lobe of the liver. Indeed, in some cases the growth may be felt below the level of the umbilicus.

Cancer of the Cardia.—When the disease involves primarily the cardiac orifice the clinical picture is very different. The first complaints then are usually of difficulty in swallowing,

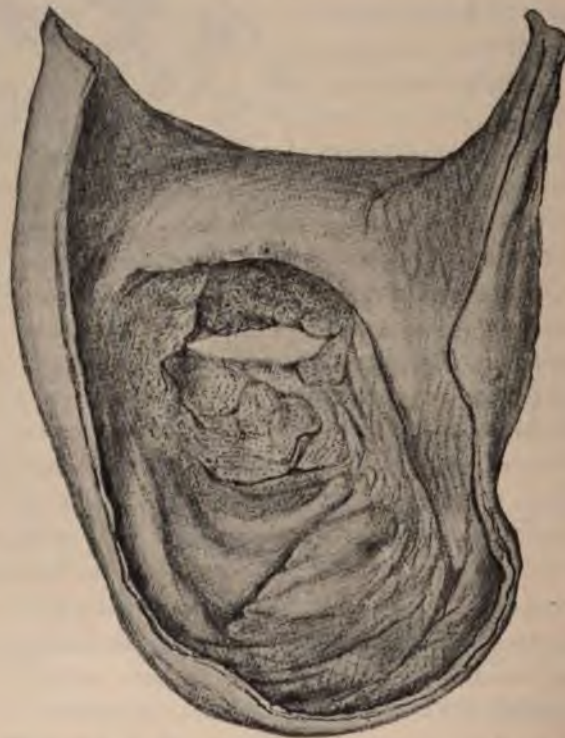


FIG. 78.—Cancer of the pylorus. (From Sidney Martin's "Diseases of the Stomach.")

and of the regurgitation of food which has failed to pass the obstruction. The patient is conscious of a stoppage in the lower part of the esophagus, and of the necessity of taking an unusually large amount of fluid to facilitate the passage of the swallowed bolus into his stomach. There is emaciation, in

spite of possibly at first a good appetite and fairly full feeding. The stomach contracts, and may become very small. The matters ejected contain undigested aliment with saliva, mucus, and often blood, but no HCl or gastric ferments. There is pain referred to the site of the cardia or sometimes to the back opposite. The obstruction at the cardia may usually be easily

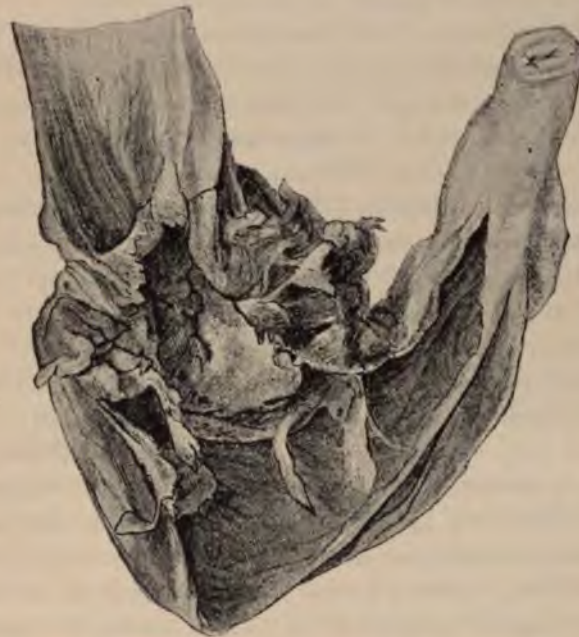


FIG. 79.—Cancer of the cardia. (From Sidney Martin's "Diseases of the Stomach.")

recognized by the use of stomach tubes or esophageal bougies of graduated sizes, beginning with a full size and introducing successively smaller, till one is found that will pass through.

In doubtful cases, to decide whether food is retained in the esophagus, you should first introduce a large stomach tube as far as it will go, noting the point where it is arrested, and then, with the help of a Kuttner aspirator, inserted in the tube (a cut of this instrument is shown on page 114), bring up what-

ever will come. Afterward pass into the stomach through the stricture, if possible, a smaller tube, and extract some of the contents in the same manner.

If the contents first obtained were coarse, undigested, and free from peptones, HCl, or the usual gastric ferments, while those obtained with the smaller tube are different, the fact of retention in the esophagus would be established.

A stenosis of the cardia determined positively by such instrumental methods, taken in connection with localized pain, steadily failing strength and flesh, and the development of a cachexia would justify a diagnosis of cancer in that region. Another sign of some confirmatory value is a delay of ten to fifteen seconds in the time of hearing the gurgling sound which is normally heard about seven seconds after swallowing liquids. To recognize this, you should place the stethoscope over the region of the cardia and hold it there while the patient swallows.

In cancer of the body of the stomach the organ does not usually dilate (though it will often be found to have been enlarged before), and it may even contract. The vomiting, therefore, will seldom be of such large quantities of stagnant contents as when the growth involves the pylorus, but the pain, cachexia, hemorrhages, and other symptoms are very similar.

Hemorrhage from a gastric cancer may not reveal itself by the vomiting of blood, but in such cases, besides the appearance of altered blood in the stools, there will be usually such symptoms as pallor and weakness, or dizziness when the loss has been large—possibly fainting or collapse.

SARCOMA OF THE STOMACH

As a rule very little importance is attributed to the non-carcinomatous tumors of the stomach. It is rare to encounter in the stomach any tumor other than a cancer. Even when other kinds of growths are found here, it is very difficult to diagnose them from carcinoma, and next to impossible when they are equally malignant, as in the case of sarcoma.

Still there are some points of difference between the symptoms and signs of the two classes of malignant neoplasms.

Sarcoma of the stomach being so rare a disease, its *pathology* is of comparatively little interest or importance to clinicians. As one author expresses it, the disease belongs to the curiosities of the deadhouse. It may be primary or secondary and may affect any part of the viscus, though it is most likely to be found on the greater curvature. With the exception of the lymphosarcoma the secondary form is even less frequent than the primary, and yet, according to Dock, secondary sarcoma of the stomach is not so rare as secondary carcinoma of the same organ.

The varieties of sarcoma which have been described by gastrologists are the spindle-celled, the round-celled, including lymphosarcoma, angiosarcoma, myosarcoma, and fibrosarcoma.

Ætiology, Incidence, etc.—We know no more as to the origin of sarcoma than of carcinoma, except that it often occurs in a part which has been subjected to irritation or injury of some kind—trauma.

It may be either primary or secondary and affects both sexes about equally, so far as has been observed. Some of the forms of sarcoma, especially primary lymphosarcoma, according to Schlesinger, may appear at any age, but oftenest in the young—between the ages of twenty and thirty-five years.

The same author, who has made a particularly extended study of sarcoma, holds that the other forms, contrary to the prevailing opinion, are rather more likely to occur in the old than in the young.

Symptoms and Diagnosis.—As with cancer of the stomach, sarcoma usually begins insidiously, and, especially when there is a diffuse infiltration of the greater curvature or body generally, may for some time remain without symptoms. In other cases you will observe the same symptoms already described as occurring in carcinoma. In these typical cases both the local gastric and the general or constitutional symptoms may be ex-

pected, even to the vomiting of blood or altered blood, though this symptom would seem to be less frequent than in the case of cancer.

There may be dilatation of the stomach with all its serious train of consequences, including sometimes tetanus, when the sarcoma involves the pylorus in such a way as to produce stenosis; and lymphosarcoma is said to be capable of producing dilatation, even without having obstructed the pylorus.

The chemical findings differ in no essential respect from those present in cases of gastric cancer.

Schlesinger emphasizes certain points, however, as useful in making the differential diagnosis: Swelling of the spleen is more frequent in sarcoma, and there is a greater tendency to develop metastasis in the intestines as well as in the skin, where various-sized nodules may frequently be found. As is stated in Lecture LXIII. regarding Sarcoma of the Intestines, the disease does not generally cause stenosis of the gut; it may, therefore, be inferred, when a tumor of the stomach produces a metastatic growth in the bowels without obstructing them, that it is sarcomatous rather than carcinomatous.

Sarcoma usually grows faster and is likely to attain a much larger size than cancer. The tumor usually is smoother—not knobbed or nodulated as a rule. And, if its more frequently observed course in the bowels can be accepted as a criterion, it kills sooner than cancer of the stomach. The fatal result may occur within less than a year, though Riegel is authority for the statement that it may be exceptionally delayed as long as three years.

Except for the fact of its more rapid course, it would seem of little clinical importance to make the diagnosis of sarcoma from carcinoma of the stomach.

BENIGN TUMORS OF THE STOMACH

These include myoma, fibroma, lipoma, papilloma, cyst, and lymphadenoma, the first four of which tend to produce polypi. These are practically never recognized in the stomach

during life, and they are, therefore, of very trifling clinical importance. A few cases, however, are on record in which such growths have been the cause of symptoms—pain, vomiting, and even hematemesis, and very exceptionally obstruction of the pylorus with dilatation. In any anomalous case, therefore, which may confront you, it is well to remember that such symptoms can possibly arise from a no more serious cause.

Lymphadenoma.—Lymphoid tumors in the stomach, though exceedingly rare, have by extension to various other organs, including the spleen and intestines, been known to result in death. Nodules were found scattered through the affected parts, and diarrhea was among the symptoms noted.

Foreign Bodies in the Stomach.—Hysteric women will occasionally swallow enough of their hair to produce, in time, palpable and movable tumors in the stomach. Numerous cases of the kind are on record, in some of which the diagnosis of cancer has been made. Serious failure of health results and continues till the tumor is removed.

The swallowing of knives or other objects, in imitation of jugglers, has been responsible for other factitious tumors in the stomach. In a few instances, also, indigestible portions of food seem to have been agglutinated into a hard mass which remained in the stomach with the result of producing a palpable tumor, which mechanically impaired digestion and injured the general health. Any such tumor should be easily diagnosed by its perfect mobility.

Treatment.—None of the benign tumors or foreign bodies in the stomach are amenable to other than surgical treatment. In any such case in which a tumor is palpable, an exploratory incision should be made with a view to a prompt removal of the offender whenever practicable.

Thickening of the Pylorus.—Under various conditions a thickening or swelling of the pylorus can occasionally be made out by palpation, when no malignant growth exists. This generally coincides with a stenosis of the pyloric outlet with consequent obstruction and dilatation of the stomach. Indeed the

obstruction of the outlet is primary, and the thickening of the muscles a result. It is easily intelligible that, whatever the cause of the stenosis, the consequences to the stomach are much the same, though in cancer or sarcoma there is an added cause of rapid failure of health.

The most frequent origin of a non-malignant thickening or resistance felt in the pyloric region is the cicatrix of a healed ulcer. This subject is discussed in Lecture LII. in connection with the sequels of gastric ulcer. Such a swelling is small and elongated or oval in form, and is frequently immovable. When the stomach is in normal position and of normal size, such a tumor cannot be felt—at least until after the viscus has been strongly inflated—because of its being covered by the left lobe of the liver. But in displacement, and in dilatation, of the stomach, one or both of which nearly always develops soon after the occurrence of any mechanical obstruction of the pylorus, the thickened pylorus may often be felt, especially in thin persons, just to the right of the median line, and somewhere at or below the level of the navel.

Hypertrophic stenosis of the pylorus resulting from the proliferative form of gastritis has been described by Boas and others. This is another condition in which there is obstruction of the gastric outlet, with sometimes a sufficient amount of resulting swelling of the mucous membrane and hypertrophy of the muscularis to form a palpable tumor.

The diagnosis of all such pyloric hypertrophies is from cancer of the pylorus, which is by all odds the most frequent cause of a tumor in this region. In cancer, beside the comparatively rapid loss of flesh, strength, and color, with the development usually of cachexia, there are certain local peculiarities in the tumor which help to differentiate it from a thickened and swollen pylorus.

The latter is always small and narrow as well as smooth, while carcinoma is likely to develop irregularly, producing a nodular swelling, and moreover, soon grows to a much larger size than the benign form of swelling ever attains.

LECTURE LX

THE DIAGNOSIS OF CARCINOMA OF THE STOMACH

THERE should be no difficulty in recognizing a typical cancer of the stomach, when the tumor is palpable. The diagnosis can then be made certainly from the unevenness of the growth, its mobility, as a rule, and its association with the symptoms described in the previous lecture, especially the presence of pain, which is more or less constant, cachexia, anorexia, and vomiting, with the occasional appearance in the vomited matter as well as in the stools, of blood, which is most frequently in small amounts and of dark altered appearance; but may be in larger quantity, when it is usually bright red. Further diagnostic points are the characteristic chemic and microscopic findings previously described, the marked insufficiency of the gastric muscular power and the comparatively rapid and usually progressive loss of strength and flesh, the muscular tissues being lost faster than the fatty—just the contrary from what happens in tuberculosis.

But in these days when surgery can sometimes, under proper conditions, perform what would have seemed miracles to a former generation, it is exceedingly important to make the diagnosis of gastric carcinoma at the earliest possible moment and before a tumor can be made out. Often when a tumor is palpable, the time for operation has already gone by.

It is your duty to make, or have made for you, a probable diagnosis in such cases at a time when, if, after an exploratory incision, cancer be found, an operation can be done with the reasonable hope of at least considerably prolonging life. Personally, I have faith enough in the possibilities of both medicine and surgery, to believe that the time will soon come when the

obstruction of the outlet is primary, and the thickening of the muscles a result. It is easily intelligible that, whatever the cause of the stenosis, the consequences to the stomach are much the same, though in cancer or sarcoma there is an added cause of rapid failure of health.

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The latter is always small and narrow as well as smooth, while carcinoma is likely to develop irregularly, producing a nodular swelling, and moreover, soon grows to a much larger size than the benign form of swelling ever attains.

equipped in this respect, it is desirable to insert here a brief account of some of the microscopic appearances which are highly confirmatory, even if not alone diagnostic, of cancer of the stomach. The Boas-Oppler bacilli have already been described in the preceding lecture. (See Fig. 77.)

Histologic Changes in Gastric Cancer.—More conclusive as to malignancy is the finding of *nests of cancer cells* or other histologic changes characteristic of carcinoma, and I agree with Hemmeter, that considering the seriousness of the disease, we are justified, if necessary, in curetting in a cautious way with a rather sharp-eyed rubber tube, for fragments of a suspected growth in the stomach. Hemmeter says:¹

“Whenever we find pieces of mucosa in which the glandular ducts are elongated and dilated, and the cells present numerous kariokinetic figures, and when asymmetrical and hypochromatic forms are found, the possibility of the existence of carcinoma should suggest itself, even when typical carcinoma cells are absent; particularly when the interstitial tissue is considerably increased and broadened, showing much small, round-celled infiltration, when numerous eosinophilic cells are present and the parietal or oxyntic cells have disappeared, and are replaced by cylindric or cuboidal epithelial cells, which proliferate down into the peptic ducts from the vestibular alveoli.”

The illustration on page 624, Fig. 80, represents a section made from a carcinoma of the pylorus.

Pus cells in large numbers may be present in the stomach contents in a small proportion of cases of gastric cancer in the stage of ulceration, but not plentifully in other cases, except when there is an abscess in the stomach, or one which has opened into it.

Though there is always anæmia in cancer of the stomach, which increases as the disease advances, finally developing into a positive cachexia, there are probably no constant *changes in the blood* that would distinguish it certainly from other forms of anæmia. A disproportionately low percentage of hemo-

¹ “Diseases of the Stomach,” Third Edition, Philadelphia, 1902.

globin and, also, an absence of the usual leucocytosis after eating, have been observed, but are by no means present in all cases, and, therefore, are not pathognomonic.

A confirmatory sign often discernible and always to be sought for, is a *swelling of the lymphatic glands*, though such a glandular involvement is much less frequent than in cancer of other organs. It has been variously estimated to exist in from 23 to 50 per cent. of all cases of gastric cancer.

Boas considers *adema of the ankles or feet*, even though only



FIG. 80.—Section from carcinoma of the pylorus.

transitory, a sign of cancer of the stomach—and one which may be present in the beginning of the disease. When such œdema exists with symptoms pointing to disease of the stomach, it would certainly possess some confirmatory value, if no other cause for it could be found.

In cancer of the cardia, besides the symptoms previously

mentioned, pain is likely to be elicited by pressure or percussion over the lower end of the sternum, and the stomach will be ultimately contracted, rather than dilated as when the pylorus is involved. In cancer of the body of the stomach, the organ may be either of normal size or contracted, rarely enlarged, unless the enlargement antedated the tumor, and there is more likelihood of the disease running a latent course here than in other parts of the organ. Not seldom it is unsuspected until a tumor is palpable.

The diagnosis of cancer from ulcer, from hyperchlorhydria and acid gastric catarrh, as well as from gastralgia, is fully given in a tabular statement which will be found in Lecture LIII., on the Diagnosis of Gastric Ulcer. It is also further discussed in Lecture LXI., entitled the Differential Diagnosis between Gastric Carcinoma and Round Ulcer.

Carcinomatous Ulcer.—Carcinoma which has developed in an ulcer can be differentiated from simple ulcer by the history, there having been at first the usual symptoms of ulcer, followed by cachexia with loss of strength and flesh, and a change in the character of the pain, from one that was acute, paroxysmal, and much aggravated by food, to a dull or moderate pain that is more or less constant with no, or only an unimportant, increase after eating. Later the presence of a movable, uneven tumor would clinch the diagnosis. The persistence of free HCl with the symptoms and signs of cancer usually means a carcinomatous ulcer.

From *chronic asthenic gastritis* cancer of the stomach cannot at first be positively diagnosed, since more or less catarrh accompanies cancer. In both, much mucus, a heavily furred tongue, and nausea may occur; and in both there is usually sensitiveness to pressure over the organ; but chronic catarrh of the stomach is rarely painful, especially in its earlier stages, while cancer may be almost from the start. When there is pain with gastritis, it is nearly always digestive, *i. e.*, confined to the period of two to six hours following meals when digestion is in progress; while in cancer, though the pain may be

aggravated somewhat after eating, there is likely to be, at least, an uncomfortable sensation, even when the viscus is empty. Besides, in the later stages of cancer, changed blood nearly always appears from time to time, both in the vomit and stools, but nothing of the kind occurs in gastric catarrh.

Apart from the pain, hemorrhages, and tumor of cancer, the most striking difference is, that in catarrh, the symptoms will nearly always steadily improve under a proper treatment, strictly and persistently carried out, while cancer, with the exception of possible brief spells of relief, or even gain in appetite and digestive power, tends to grow surely worse in spite of any treatment. Besides the motor power of the stomach walls, which is so constantly and usually markedly lowered in cancer, is often good or fair during a large part, at least, of the course of chronic gastritis, and may be quite normal for years. Finally, the appetite, color, flesh, and strength, which are not necessarily much impaired in gastric catarrh of moderate degree, and are often well maintained, are always progressively lost in carcinoma from a comparatively early stage, as a rule, with possible slight exceptions for a week or two. Moreover, do not forget that you will be likely to see at least twenty cases of catarrh of the stomach for every one of cancer in the same organ.

From atrophy of the stomach, which is the final stage of chronic gastric catarrh, it is also difficult sometimes to diagnose cancer, since there may be a complete absence of free HCl and of the ferments in both, and exceptionally there may be much pain in atrophy. But the pain of atrophy is digestive, and in my experience exceptional, and the tongue is likely to be rather clean, and the wash water after lavage free from mucus, while in cancer the pain is more constant, the tongue always dirty, and the stomach generally full of mucus.

The nervous forms of lowered digestive ability should never be confounded with cancer, since they are generally improved by tonic treatment and generous feeding, and are very changeable as to both the secretion of HCl and all the symptoms, in-

stead of showing an almost continuous and rapid downward course, as does cancer. Pain is not very often present in them—never constant pain—and hemorrhage is wanting.

Atonic dilatation of the stomach, dependent upon a spasmodic contraction of the pylorus, an actual narrowing of the outlet, as the result of a healed ulcer, or obstruction from other mechanical cause not malignant, needs to be differentiated from pyloric cancer, since in the former there may be; though exceptionally, marked anæmia, and there is often severe pain, though paroxysmal in character, as well as, generally, the form of vomiting characteristic of stagnation and retention of food. The most important difference before the time when in cancer a tumor can be recognized, is the character of the pain, which is dull or gnawing, and rather constant in the latter, and fitful or paroxysmal, sharp and colic-like in the spasm of benign stenosis of the pylorus, with dilatation. Then, there is not often so bad a tongue, nor so persistent a failure of the appetite with an especial disgust for meats in the dilatation from other causes, as in that from malignant disease of the pylorus. The stenosing form of gastritis also produces a dilatation with symptoms very similar to those resulting from other non-malignant forms of pyloric stenosis.

For the recognition of a cancerous tumor of the stomach, inspection, percussion, and palpation may all help somewhat, but the last will yield by far the most information to the physician with skilled fingers. You should examine the patient by all these methods in various positions of the body—lying supine and prone, and on either side, as well as standing—both before and after inflation of his stomach with gas, as well as before and after letting him drink a pint of water. Inflation with gas is often particularly useful in bringing hidden tumors into view. In the case of tumors of the anterior wall, transillumination by means of the Einhorn electric lamp, introduced into the stomach after the patient has drunk one or two glasses of water will sometimes help in the diagnosis. But the Roentgen rays will often afford more positive information.

The Differential Diagnosis of Gastric Cancer from Other Abdominal Tumors.—The annexed table, taken from Boas' "Diagnostic und Therapie der Magenkrankheiten," cannot well be improved upon. The stomach is first to be inflated with air, or with carbonic acid gas by administering a teaspoonful of sodium bicarbonate dissolved in a goblet of water, followed by some acid, preferably, according to my experience, by 8 to 12 minims of strong HCl added to half a goblet of water; afterward the colon is filled with warm water by a fountain syringe. The results upon tumors in different locations are recorded in the table as follows:

<i>Tumors of the</i>	<i>Upon Inflation of the Stomach,</i>	<i>Upon Filling the Colon with Water,</i>
1. Stomach, (a) pylorus,	Move to the right and downward.	
(b) anterior wall and greater curvature	Feel broader and less distinct at their margins.	All tumors of the stomach simply move upward.
(c) the lesser curvature	Disappear entirely.	
2. Liver,	Move upward and to the right, so that the anterior border of the organ becomes more distinctly palpable.	Raise the lower border upward; a tumor of the gall bladder is drawn forward. With very large tumors there may be no change of position.
3. Spleen,	Move towards the left; often also downward.	Move upward and to the left. Movable tumors may thus become recognizable in the normal splenic region.
4. Colon, 5. Kidneys,	Move upward.	Do not move upward. At first they may ascend a little, but finally disappear. Movable kidneys return to the proper renal region. In large tumors of the kidneys the median border only becomes indistinct.
6. Omentum,	Move downward.	Move downward.
7. Pancreas,	Disappear upon inflation of the stomach.	

Let me repeat and emphasize the fact, that a tumor connected with the stomach, especially the pylorus, may be found in almost any part of the abdomen. In elderly persons the stomach, even when it does not contain a neoplasm, is very generally either enlarged or displaced downward, and the weight of a tumor rarely fails, in time, to drag the organ below its normal location.

All authorities agree that tumors originating in the stomach are nearly always cancerous. In case of doubt on this point, its roughness of surface, the pain, cachexia, and the usually rapid downward progress of the patient should distinguish carcinoma from other tumors, even in the absence of the chemic and microscopic findings.

LECTURE LXI

THE DIFFERENTIAL DIAGNOSIS BETWEEN GASTRIC CARCINOMA AND ROUND ULCER

THE diagnosis of carcinoma of the stomach has already been quite fully discussed, and in the lecture on The Diagnosis of Gastric Ulcer a table is included, in which are given in a condensed form the chief distinguishing characteristics between that disease and others with similar symptoms, including gastric cancer. But the differential diagnosis between these two may with advantage be further amplified and emphasized.

For the expert gastrologist it is, as a rule, easy enough to diagnose a carcinomatous growth in the region of the stomach from a gastric ulcer. When a tumor can be felt in a position, or of a size or form, which would exclude the elongated cylindric thickening of the pylorus due to an ulcer in that region, cancer must always be suspected, and may be diagnosed positively if there are present also the symptoms of the latter disease—viz., a progressive loss of flesh and strength, pain, vomiting, hematemesis, cachexia, and an absent or markedly lowered secretion of the HCl and ferments of the gastric juice. Indeed, when such a tumor can be made out, and a part only of the above symptoms are present, including pain, emaciation, and a rapid loss of strength, or even the latter two without pain, you may be sure enough of cancer to advise an exploratory incision, provided there be no signs of metastases or involvement of neighboring glands.

But it is in the beginning of the disease before a tumor is demonstrable that it is very difficult to recognize. The early stages of carcinoma involving the body of the stomach or the

pylorus are more likely to be confounded with gastric ulcer than any other disease, especially by physicians who do not make a practice of testing, or having tested, the stomach contents in every suspicious or stubborn case of indigestion. Moreover, an analysis of the gastric contents with the finding of HCl in moderate excess, though it affords strong presumptive evidence that such symptoms as pain in the stomach, with occasional vomiting, with or without hemorrhage, are due to ulcer, does not exclude the possibility of cancer which has developed in the site of a previous ulcer; and, still less, on the other hand, would the failure of HCl alone prove certainly the existence of cancer. The totality of the chemic and microscopic findings and the symptoms, as well as the results of treatment, must decide in the absence of a palpable tumor.

Cancer of the Cardia, Differentiated from Ulcer.—You are not likely to mistake cancer of the cardiac orifice of the stomach for ulcer, since the symptoms of these two affections are widely different. In the former, the pain and sensitiveness to pressure are both usually experienced over the lower end of the sternum, rather than over the stomach itself, and careful sounding will discover an obstruction at the cardiac opening. There is difficulty in swallowing, and finally regurgitation from the esophagus of wholly undigested food, not true vomiting.

In the *other forms of gastric carcinoma*, the main points in which the symptoms differ from those of ulcer are the tendency of the *pain* to persist during most of the twenty-four hours, without regard to the digestive process, whereas, in ulcer, there is usually an entire absence of pain until food is taken, when it shortly comes on more or less acutely and persists until the meal has been completely digested—often until it has been evacuated from the stomach. After its evacuation, there is generally an entire cessation of the pain from ulcer. As to *hemorrhage*, there may be none at all in either disease until it is considerably advanced. The most important differences are that in cancer there are likely to be frequently re-

curing small bleedings after ulceration of the growth has begun, but rarely a large or serious one. In ulcer, while the bleedings may be either large or small, there are apt to be spells of hemorrhage at long intervals, and generally they are larger and involve a greater loss of blood than in the case of cancer. During such a spell, the loss of blood may be temporarily controlled by remedies, but will often recur within a day or two, and such recurrences may continue until the ulcer can be healed, or till a clot becomes organized in the bleeding vessel. Then there may be no more for weeks or months, even though the ulcer persists with its other symptoms, pain, tenderness on pressure, etc., except, of course, when treatment has been so thorough and effective as to produce entire healing.

Chief Diagnostic Points.—Bear in mind that in cancer there is a *progressive loss of appetite, flesh, strength, and color*, almost from the beginning, while in ulcer there is most commonly a sharp appetite with other indications of a good nutrition, except when the ulcer is very chronic, or has developed after such a long persistence of a neglected and marked hyperchlorhydria as to have seriously impaired the health. The pain, as well as the hemorrhage in ulcer, is likely to be more severe than in cancer. It needs to be repeated also, that the pain in ulcer is, almost without exception, limited to the time when the stomach contains food; and the more irritating the form of the food, the greater the pain, whereas, in cancer, though there may be somewhat more pain during digestion, it is the rule that a dull, gnawing ache persists pretty constantly, particularly in pyloric cancer, so that sleep is generally prevented, except with some help from anodynes. Sleep is also often impaired in ulcer, as well as in excessive HCl secretion merely, but not usually from pain, unless hearty meals are taken at night.

In both cancer and ulcer, there may be *vomiting of changed blood* resembling coffee-grounds, instead of fresh blood, but this is rather more frequent in the former than in the latter disease. Altered blood may also be mixed with the feces in either disease, even when there has been no recent hematemesis.

This results usually when there has been too small a bleeding to provoke emesis, and, in the absence of hematemesis, points rather to cancer than to ulcer.

Tenderness on pressure in or near the median line, just below the lower end of the sternum, as well as to either side of the spine at the level of the two lowest ribs, is often demonstrable in ulcer, but much less frequently in carcinoma of the stomach. It is not rarely present, however, in other diseases, as in neurasthenia. Yet when such tenderness is very acute and marked, especially posteriorly, you should think, first of all, of ulcer.

It is noteworthy, however, that many of the diagnostic symptoms, above mentioned, may be wanting particularly in the earliest stages of the two diseases. The most help may then be obtained from the chemic and microscopic examination of the stomach contents, and the microscopic examination of particles accidentally or purposely scraped off from the gastric mucous membrane. The finding of a normal, or especially of an excessive, percentage of HCl would speak in favor of ulcer, while a very low percentage, or absence, of HCl would render the diagnosis of cancer decidedly more probable. The presence of a considerable percentage—one part in a thousand or more—of lactic acid would still further increase such a probability, as would also the finding of the Boas-Oppler bacilli, or the histologic changes characteristic of carcinoma.

Carcinomatous ulcer is that form of gastric ulcer in which cancerous degeneration has taken place, and the disease thenceforth behaves like cancer. It does not differ materially from other forms of carcinoma of the stomach, either as to its signs or symptoms, except that a normal or excessive percentage of HCl usually persists in such cases, thus tending to mislead the physician who bases his diagnosis too exclusively upon the results of a chemic analysis of the gastric contents. You should suspect the presence of carcinomatous ulcer whenever you find the symptoms and cachexia of cancer to have gradually developed in a case with a history of gastric pain and hemorrhage

running back over a long period, especially when the disease has lasted more than two years. Primary gastric carcinoma most frequently comes on suddenly in persons who have previously had a good digestion.

The Therapeutic Test.—In doubtful early cases, the diagnosis may often be made by the therapeutic test. For example, if you should have a patient complaining of pain in the gastric region, directly after meals, but to a slight extent also at other times, with occasional vomitings, beginning loss of flesh and strength without much change of color, and no tumor to be felt, you might well be in doubt as to what form of disease existed. The fact that the pain persisted to some extent after the stomach was empty, would look much more like carcinoma than either ulcer, hyperchlorhydria, or gastritis. Still, it would not exclude the possibility of a gastralgia of nervous origin, and the pain between meals might be due to fermenting portions of undigested food in the small intestine, or to large amounts of gas, with marked distention of the stomach. On the other hand, there might be a similar case in which pain was experienced only when the stomach contained food, which would, of course, suggest the probability of ulcer or gastritis, rather than cancer. And yet, in the early stages of cancer, especially when the body of the stomach, and not the pylorus, is involved, the pain may be only complained of during the digestive act, and sometimes not even then. In all such doubtful cases the diagnosis can be pretty certainly determined by putting the patient to bed and feeding by the rectum, together with the other curative measures advised for ulcer. In any recent case of ulcer, rest in bed, with rectal feeding, and 30- to 60-grain doses of bismuth subnitrate, three or four times a day, with sometimes large doses of an alkali to neutralize the excessive HCl, will almost certainly remove the prominent symptoms within a few days, and if persisted in for a week or two, followed by a longer continuance of the bismuth, with a liquid diet by the mouth, gradually increased, will insure usually a speedy and complete cure of the disease. Marked relief, too,

would likely follow if the cause of the symptoms were chronic gastritis, although not so certainly then, since lavage would often need to be added to the treatment. But in a case of cancer, while certain of the symptoms might be favorably influenced at first, the growth would usually progress in spite of all treatment, and after a week or two of possible slight amelioration, the symptoms would recur and become increasingly troublesome. This is a valuable method when patients can be sufficiently controlled to carry it out, and when there is even a possibility of so grave an organic disease as carcinoma of the stomach, it is vitally important to exhaust every means to arrive at the diagnosis at the earliest possible moment, in order that the surgeon may be summoned in time to afford the patient the only chance of recovery.

LECTURE LXII

THE TREATMENT OF CARCINOMA AND OTHER TUMORS OF THE STOMACH

THE prognosis of gastric cancer has, until quite recently, been considered absolutely hopeless. However, since the surgery of the abdomen has been so extraordinarily perfected, occasional cases of apparent cure by early operative intervention have been reported. Then, too, the wonderful achievements of the Roentgen rays, violet rays, the Finsen light, and the new metal, radium, in ameliorating, and apparently, in some isolated cases, even curing malignant growths in various other parts of the body, have naturally awakened the hope that cancer of the stomach, and of the other abdominal viscera, will ultimately yield to some of these mysterious agents.

Treatment with X-Rays, etc.—The results of the trial of x-rays in this region hitherto have been much less encouraging than elsewhere in the body. Caldwell¹ cites one case reported by Despeignes² in which carcinoma of the stomach improved under daily applications of the x-rays, and quotes Skinner³ as having treated five cases of intra-abdominal tumors, with the result that two of them became smaller, and in two of the others there was gain in the constitutional condition from a course of the same treatment. Dr. W. J. Morton⁴ has also reported immediate relief of pain in one case of carcinoma of the stomach.

Dr. Morton, who is recognized the world over as one of

¹ "The Roentgen Rays in Therapeutics and Diagnosis," by W. A. Pusey and Eugene W. Caldwell, Saunders & Co., Philadelphia, 1903.

² *Semaine Méd.*, 1896, xvi. p. cxlvi.

³ *Rev. Int. d'Electrothérapie*, 1902, xii. p. 28.

⁴ Morton, *Med. Record*, 1902, lxi. pp. 361, 801.

the highest authorities in all that pertains to electrotherapeutics, has, in a personal communication to me, embodied the following report of what he considers to have been a case of cancer of the stomach, apparently cured by a persistent use of the x-rays:

Case Reported by Dr. W. J. Morton.—"Case, Mrs. F. Y., age 62. A sister died of a cancer of the stomach. Principal symptoms, intense retching in frequent attacks, and intense pain, located just to the left of the end of the sternum.

"The tumor is discernible by fluoroscopic examination, apparently about the size of a hen's egg.

"X-ray treatment, high vacuum tube, three times weekly, 18 minutes, 9 inches distant, was administered.

"In ten days the pain ceased for forty-eight hours, then returned. Treatment was continued, the intervals of relief became longer, with periods, however, of severe pain, until, in three months, no pain whatever could be felt. There existed then no retching, no distress, and no discomfort of any kind. In the patient's language, however, a 'bad spot' could still be felt.

"The patient was treated for a period of six months, and at the end of that time showed no further signs whatever of disease.

"The patient was tanned of a dark brown color at the epigastric region, and the dermatitis scaled off, but beyond this, no x-ray burn was established. During much of the time, quinine in 5-grain doses, one hour before treatment, was administered in accordance with the principle laid down by the writer in an article in the *Medical Record* of August 8, 1903, to produce an artificial fluorescence of the tissue under the influence of the x-ray."

Dr. Morton, in the same communication, adds the statement that he has treated four other advanced cases of cancer of the stomach in the same manner, but without success.

Caldwell¹ states that he, himself, has treated nine cases of carcinoma within the abdomen, without obtaining in any of them any very markedly favorable results, though most of them showed some subjective improvement, and in the cases in which pain was a symptom, he had reason to "think that it was

¹ *Loc. cit.*

positively affected." I have also seen mention of one or two other not very well authenticated cases of cancer of the stomach, which were said to have recovered under the influence of the x-rays.

Reports from Drs. Einhorn, Coley, and Snow.—Dr. Max Einhorn writes me that he has had some experience with x-ray treatment in cancer of the stomach, but has had no good results.

Dr. Wm. B. Coley, in a personal communication, writes that he has treated 110 cases of inoperable malignant tumors, of which, "38 were recurrent sarcoma, 30 cancer of the breast, and about 15 inoperable deep-seated tumors of the abdomen." Five of the sarcomas "apparently entirely disappeared, but in every instance there was a speedy return." A few of the carcinomas disappeared, but every one recurred in spite of prolonged treatment. He adds: "Deep-seated abdominal cases have given, as a rule, negative results. In some of the cases, pain has been relieved, and the growth of the tumors temporarily held in check. While very brilliant results have been reported, both in carcinoma and sarcoma, I have been unable to find a single case traced beyond two years without recurrence. I believe that the x-ray gives the greatest promise when used as a prophylactic, after primary operation, although, even here, the data are insufficient and contradictory."

Dr. W. B. Snow, a prominent authority in electro-therapeutics, reported a case of pyloric cancer in the *Journal of Advanced Therapeutics*, of June, 1902, in which, though the disease was far advanced, and the patient in a critical condition when the treatment was instituted, six x-ray applications produced remarkably favorable results, including a cessation of severe hematemesis as well as all nausea, vomiting, hiccough, and dyspnoea, an improvement in the pulse, and especially a decided softening of the tumor itself. Later, the patient became suddenly worse and died with symptoms pointing to general auto-infection. This is one of the dangers attendant upon the

rapid resolution of an internal malignant growth by means of the x-rays.

- Dr. Snow writes me that in another case seen by him, a cancer of the lower end of the esophagus was greatly improved under x-ray treatment, but later succumbed. He also informs me that Dr. J. N. Scott of Kansas City, Mo., has reported to him a case of cancer of the cecum in which a definite cure was effected by the x-rays.

As Coley says, "the data are insufficient and contradictory," and we must wait longer for the final verdict as to the value of the various rays in the treatment of malignant tumors. Some of the results, however, seem to have been good, others very promising, and altogether, there is reason for indulging the hope that with further perfecting of our appliances and technique, these newer methods will yet find a definite and useful place in our armamentarium against malignant disease. It is by no means impossible that in this wonder-working age, they may eventually effect a most beneficent revolution in the prognosis and treatment of carcinoma and sarcoma, in the viscera, as well as in external parts.

Early Diagnosis Indispensable.—Of two well-established truths regarding gastric cancer you may rest assured: (1) That the disease cannot at present be cured by any medicinal means; and (2) that surgery, even with the help of the new and remarkable agents above mentioned, will be equally powerless with medicine to effect a cure, except in those cases in which you, with possibly the help of medical experts, shall have succeeded in accomplishing two difficult things. One of these is to make a probable diagnosis of the disease at a very early stage, before the neighboring glands have become involved, or strong adhesions have bound the part occupied by the new growth to adjacent organs, and usually before the tumor itself can be felt, or cachexia has developed. The other is to induce the patient and his family to consent to an exploratory incision before it is too late. You should remember that an explora-

tory incision involves very little risk, when done after all necessary preparations by a skillful laparotomist in a person who is still well nourished. Another point of some importance to the patient is also to be borne in mind, viz., that while most surgeons are accomplished in many things besides cutting and other operative work, they are not, as a rule, to which there are exceptions, so well qualified to make an early diagnosis of gastric carcinoma as those physicians who, besides having acquired a proper skill and experience in the art of palpation, have also been especially trained in the recent methods of examining the stomach, not only as to its size and position, but also as to its motor and secretory functions. You should all strive to acquire this skill and special training yourselves. Even with the aid of these methods of precision, it will not be possible, always, to make the diagnosis at a time when an operation can offer hope of a radical cure; but it sometimes can, and without them such a consummation is impossible.

Indications for an Exploratory Incision.—Indeed, whenever a case presents the symptoms of a severe chronic gastric catarrh, including the absence of free hydrochloric acid, and there is at the same time much lactic acid present, a rather persistent pain localized in the stomach, and marked loss of motor power in the organ, as well as weakness and emaciation, and these symptoms not only continue, but get worse, in spite of lavage, appropriate diet, tonics, and digestive aids, not longer than three, or at the most four weeks, should be wasted in expectant treatment. Under these circumstances, the suspicion of carcinoma should be strong enough to warrant summoning the best obtainable laparotomist and re-examining the patient thoroughly under an anæsthetic. This might reveal an incipient tumor not palpable before; also sufficient glandular or other complications already to render any operation inadvisable, or to limit the surgical intervention to some palliative procedure merely. But supposing that, in such a case, under anæsthesia no contra-indications should be found, there would be warrant, according to the best recent authorities, for making an explora-

tory incision with preparations for some remedial operation, radical or palliative, if a tumor should be discovered.

Operative Treatment.—An operation having been decided upon, the surgeon may hopefully extirpate the pylorus (pylorectomy) for a growth in that region; or remove any other part of the stomach, or even the whole organ—gastrectomy, incomplete or complete. Or, if a cancer obstructing the pylorus has progressed to a hopeless stage, a direct communication may be established between the body of the stomach and the small intestine—gastro-enterostomy. This often prolongs life for many more months, and gives the patient increased comfort. When a tumor obstructs the cardiac orifice, the usual operation is gastrostomy, which consists in making an opening directly into the stomach through the abdominal wall. Through this the patient can be fed while life lasts. Sounds can sometimes be passed and the stricture be thus dilated from below, through the same orifice.

The Use of the X-Rays, Radium, etc., in Cancer of the Stomach.—As above indicated, the time is probably near at hand when the x-rays and some of the related agents—violet rays, Finsen light, and, possibly, though with less probability, radium—will afford valuable aid in the treatment of cancer within the abdominal viscera, as well as in other regions of the body. So much has already been done with these new agents that we are justified in hoping for still more. The most recent reports, from entirely trustworthy sources, leave little room for question that some of these forces are now causing the disappearance—a gradual melting away, as it were—of a certain proportion of cancers and sarcomas on the exterior parts of the body, as well as in the more accessible cavities, such as the mouth, nose, rectum, and vagina. It has not been proved that these are definite cures, and Coley has noted a recurrence in all such cases seen by him; but the results are certainly encouraging.

Two difficulties are in the way of the achievement of like results in the stomach and intestines: (1) The depth of the

overlying tissues which the rays must penetrate before they can effectively influence the diseased structures, and (2) the inability, under present conditions of the operator, to see how to apply the rays in just the right position, and at the proper distance from the point to be affected. Neither of these would seem to be insuperable. The thickness of tissues to be penetrated ought to be successfully overcome by using a sufficiently high tube, and applying it nearer to the skin, even at the risk of producing severe burns, since such burns are of small consequence in comparison with the dangers of a malignant growth; and in the case of a palpable tumor in the pylorus or anterior wall, the sense of touch will enable the operator to direct the rays to the exact point required.

In the case of tumors on the posterior wall of the stomach or not yet palpable, some way might be devised to carry a small piece of radium into the stomach through the mouth, and then, possibly with the help of the gastroscope, to apply it to the cancerous growth, if only the earlier rhapsodic reports concerning radium had been sufficiently confirmed. But, unfortunately, they have not been, and it begins to look as though the therapeutic powers of this sensationally introduced new metal had been much overrated.

Since the foregoing was put in type a practicable method of carrying out my suggestion concerning radium has been devised.

Storck of New Orleans reports¹ a case of undoubted carcinoma of the stomach which was greatly relieved after a few treatments with radium. He applied it by means of a contrivance of his own invention and called by him an intragastric radiode. He thus describes it:

"It consists of an aluminum capsule containing 10 mg. of 7000 radioactive radium attached to a flexible copper wire passed through a suitable rubber tube (a stomach tube will answer every purpose), the capsule being allowed to project beyond the end of the tube. The intragastric radiode is so

¹ *Am. Med.*, May 21, 1904.

manipulated as to come immediately, or as nearly as possible, in contact with the growth."

In the case reported by Storck the patient, aged seventy, and having all the symptoms of advanced carcinoma (severe pain, coffee-ground vomit, absence of HCl and presence of lactic acid, Boas-Oppler bacilli, and tumor in the pylorus), was given three-minute treatments three times a week. After the third application his pain was relieved, and after the fifth, the vomiting, previously almost continuous, nearly ceased. After three weeks of such treatment, the pain remained absent, but no diminution in the size of the tumor or amelioration of the cachexia could be noticed.

Storck intended to go on with the treatment in the hope of effecting yet more positive benefit.

Another difficulty is the accumulation in the body of the toxic products of the disintegration or resolution of malignant tumors, but some way will probably be found to avoid this danger.

Even the slightly encouraging results so far obtained from the experience with x-rays in malignant growths of the abdominal viscera are enough to warrant a trial of them in inoperable cases, and especially after an operation for the removal of the tumor has been done, so as to accomplish as much as possible in this way toward the prevention of a recurrence. We should stop at nothing that promises in howsoever small a degree to lessen the danger of recurrence, and even though it should require hundreds of treatments, and involve severe burnings of the skin, these would be gladly undergone by many patients if thereby they could be encouraged to hope that the tumor would not recur, or even that it would only recur after a respite of some years.

The arguments advanced in favor of following every operation for the removal of cancer with a prolonged treatment by the x-rays seem to be unanswerable, and there are also equally strong reasons for beginning the treatment of the same with this agent whenever, from any cause, the operation has to be

deferred, though it be for even a few days only. Life is very precious, and in such serious cases everything possible to increase the chances in favor of the patient should, by all means, be done. If the x-rays could save only one case in a hundred, or only prolong by a few months the lives of such patients in a small proportion of cases, it should be employed, since, whatever its inconveniences, it can scarcely add to the dangers of a fatal termination, but, to some extent at least, lessens them.

In discussing this subject, Caldwell,¹ who is conservative in most of his conclusions, says:

“Under the influence of x-rays alone, carcinoma can be made to disappear, and can be replaced by healthy tissue. This is established, not only clinically, but also by microscopic studies. Such a disappearance of a malignant growth is a new fact. It gives us a method of treatment of malignant growths essentially new in principle.”

Medicinal and Palliative Treatment.—Naturally, you will be likely to look upon a case of beginning carcinoma of the stomach as simple indigestion, or catarrh, and treat it accordingly. At first, before cancer is even suspected, nothing better could well be done. But when you put the patient upon a bland, easily digestible diet, administer the appropriate correctives based upon a precise study of the gastric functions, and secure the best possible hygienic conditions, including moderate exercise out of doors, with rest after meals, and possibly general massage (with cautious abdominal massage as well, when the secretion of HCl is deficient), besides a judicious alternation of general systemic tonics, including predominantly iron, arsenic, strychnin, hydrochloric acid, and the glycerophosphates or hypophosphites, you have reason to expect improvement if no more serious condition exists than nervous dyspepsia, or even a moderate gastric catarrh, with the usually accompanying neurasthenia. If, instead of improvement, there results a further downward progress, which is not checked, or the symptoms are only temporarily ameliorated, with then further aggravation in spite of treatment, even

¹ *Loc. cit.*

lavage affording slight or no relief, you will have strong reason for suspecting that something more serious is the matter. You will, in that case, of course, leave nothing undone that will help to decide whether or not you are dealing with a case of cancer in a stage when it may still be curable by surgical measures. You should then proceed as already advised for such cases.

But when you have taken the alarm too late, or, if not, have failed to get in time the consent of the patient for an exploratory incision, some palliative operation may still prolong life, and if this should be declined, you can yet do much by medical treatment to defer the inevitable fatal termination, and render the condition of the patient more tolerable while he lives.

The difficult task now devolving upon you will be:

1. To relieve the accompanying asthenic gastric catarrh, and the symptoms dependent upon it, including the nausea and vomiting, the failure of the secretion of HCl and of the ferments, and, in part, the lowered nutrition.
2. To combat the decreasing gastric motility as well as the anæmia, debility, and emaciation.
3. To control hematemesis.
4. To assuage the pain, secure sleep, and make the patient as comfortable as possible.

Dietetic Treatment.—All these objects may be promoted to a considerable extent by a suitable diet, and the indications here are not wholly the same as in ordinary chronic gastric catarrh of asthenic type, except when this is complicated by failing motor power of the stomach. The weakened motility, or propulsive power, is always a conspicuous feature of advanced gastric carcinoma, and this calls imperatively for small and relatively frequent feedings with the blandest and most easily digestible nourishment. In probably a large majority of cases, good, fresh milk, in some of its forms or preparations, will agree best, and will need to be prominent among the nutrients depended on. Usually plain sterilized or boiled milk, with 1-12 to 1-4 part limewater, according to the degree of ir-

ritability, is as suitable as any form, if digestives are given after the meals, but sometimes it agrees much better when pre-digested or peptonized. Other excellent foods for aggravated cases are the whites of eggs beaten up in water, well-cooked gruels, peptonized or not as found necessary, whey, koumiss, gelatin, the juice pressed out of lightly broiled steak, and vegetable purées. Any of the liquid foods may be thickened by the addition of beef powder or of plasmon. The various proprietary foods, both the albuminous and non-albuminous kinds, will often suit well, and will help to afford variety in the worst cases, especially. In the earlier stages, and in those cases with less irritability and more digestive power, stale bread or toast and butter, crackers, fish, oysters, hashed lean meat, soft-boiled or poached eggs, thoroughly cooked cereals (the finer kinds), with milk or cream, and even the blander vegetables in which the starch has been well dextrinized by cooking, may be allowed, but all these should be finely divided before eaten. As to beverages, the previous habits of the patient will often decide. The lighter wines in small quantities may add slightly to the nutrition, and tea and coffee, unless they specially disturb the stomach, should not be denied to patients who have been accustomed to them, though they should be taken without sugar whenever fermentation is very troublesome. The richer chocolates will almost certainly disagree, and often the choicest cocoa, though these are all highly nourishing. An infusion of cocoa shells is more suitable, and there is no objection to the cereal coffees sweetened with saccharin. Sugar, being the most fermentable of all foods, should generally be avoided.

As the disease advances, and the ability of the stomach to empty itself lessens more and more, the amount of the liquids taken by the mouth will have to be diminished—especially the amount taken at a time. It will seldom be well to allow more than half a pint of liquid at any one time in this way, and much less in far advanced cases. Toward the last the demand of the system for liquids may have to be met in part by injecting

water into the bowels, and the feeding in the later stages may be supplemented by nutrient enemias.

I. Treatment of Accompanying Gastritis and its Results.—In Lecture XLVIII. on The Treatment of Chronic Asthenic Gastritis, the methods applicable in endeavoring to ameliorate the catarrhal complication of gastric carcinoma are fully discussed, besides some, such as the application of electricity and massage to the abdomen, and various forms of active exercise, which are not suitable in cancer of the stomach, for obvious reasons. In a disease which reduces the strength and flesh so rapidly, and increases markedly the retrograde tissue metamorphosis, the strength needs to be conserved as much as possible, and exercise should be limited to the milder forms, and never allowed to fatigue. General massage and general faradization, avoiding, as a rule, the epigastric region, are, however, passive forms of exercise, which should be helpful to the nutrition except in the later stages.

Lavage is the most important of all the mechanical forms of treatment, and in the cases of pyloric obstruction, with retention and dilatation, it is indispensable. It will do more usually to relieve the nausea and vomiting, and to lessen most of the symptoms resulting from the gastritis, than any other of our therapeutic resources.

Condurango, a drug largely used in Germany, and less by American physician, in cancer of the stomach, is believed now to be helpful mainly because of the good effect it has upon the accompanying gastritis, though Ewald thinks that this "improvement of the concomitant catarrh of the mucous membrane may lessen the hyperæmia and the size of the tumor." At all events, there is much testimony from many sources to the effect that the symptoms may all lessen in severity, the appetite increase, and life often be somewhat prolonged as a result of persevering with a course of condurango. This may be given in the form of the fluid extract in doses of a dram or more, three times a day, or, as preferred by Ewald, in a maceration decoction to which he advises the addition of appropriate

doses of HCl and some carminative. Boas, Riegel, and most German writers also speak well of this remedy, while admitting that in bad cases it often fails to effect even temporary improvement.

2. **Measures against the Debility, etc.**—To combat the asthenic condition, in addition to the remedies and measures already mentioned as helpful for the gastric catarrh, including especially lavage with cleansing and antiseptic solutions to lessen the auto-intoxication, it is necessary to overcome any existing constipation with preferably douches of the colon, since they do not irritate the stomach, while they supply needed water to the body; though, when moderate doses of mild laxatives prove effective, they may answer, and are less troublesome and fatiguing. Diarrhea needs a more careful diet, possibly antiseptic colon douches, often full doses of bismuth, and sometimes stronger astringents with opium. Iron, arsenic, and strychnine, when well tolerated, may be administered to enrich the blood, stimulate appetite, etc., preferably in small and often repeated doses to avoid irritation; but frequently they will do most good with least harm when given in suppositories. In cancer obstructing the pylorus, nothing will have more effect in staying the progressive dilatation of the stomach than lavage, and a careful regulation of the diet as above advised, but strychnin hypodermically may occasionally do something temporarily. Intragastric electricity, which, in simple atonic dilatation, is our most powerful weapon, is ineffective and even harmful here. HCl and pepsin, or some preparation of papaya, may help the patient to digest more food.

3. **To Control the Hematemesis.**—This is usually much less serious in cancer than in ulcer of the stomach, and may be often avoided merely by enforcing the diet above outlined. When it occurs the patient must be kept at rest, recumbent, all food by the mouth stopped, and in the moderately severe cases the patient may be caused to swallow frequently small pieces of ice. Sometimes small draughts of quite hot water are still more efficient. Twenty- to 30-grain doses of bismuth in a

mixture with limewater, and a little essence of peppermint, may next be tried, and these are very effective also in vomiting and diarrhea. The stronger astringents, as ergot, gallic acid, etc., rarely do good in this form of hemorrhage when taken by the mouth. Ergotin or ergotol, hypodermically, is better. Extract of the suprarenal glands has been lately suggested as a safe and promising remedy. Three to 5 grains of the dried extract may be given several times a day. Locally applied, this remedy has a greater astringent effect than any other known. In the more aggravated cases, it is safer to give nothing whatever by the mouth—not even pellets of ice.

4. **To Relieve the Pain.**—External applications will sometimes relieve the pain of gastric cancer. Mustard, painting with iodine, liniments, and hot wet packs are the most easily applied, and will sometimes suffice. Among the milder internal sedatives, chloral and cannabis indica are frequently effective in allaying the pain and procuring increased sleep, and the former has useful antiseptic as well as sedative virtues. Condurango is believed by various authors also to ameliorate the pain along with most of the symptoms. Boas praises potassium iodide, especially in carcinoma of the cardia, and arsenic is thought to help often in malignant growths anywhere. Methylene blue is beginning to obtain a reputation on account of some supposed sedative properties in gastric cancer. Most recent authors concede to it considerable efficacy. It is to be given in doses of 3 to 5 grains, in a capsule daily, and Van Valzah and Nisbet advise that a little powdered nutmeg be combined with it “to correct its slightly irritant action on the urinary tract.” Marcus Fay recommends aniline sulphate, holding that it delays metastasis and cachexia and relieves the pain better than opium. But sooner or later, in all cases, opiates will become necessary. They can be given in any of the usual ways, but will be most effective hypodermically. Codein should be preferred so long as it continues to prove efficient, but at all events the patient should be made comfortable.

In a series of seventeen cases of inoperable carcinoma, including two of the stomach, Bra of Paris, and Mongour of Bordeaux, have reported (*Medical Review of Reviews*, April 25, 1900), some remarkably favorable palliative results from injecting a purified culture of the nectria ditissima, a parasitic growth found on trees and considered a kind of vegetable cancer. They injected daily 4 c. c. of this culture extract, and while in none of the cases was any noticeable control exerted over the progressive emaciation and cachexia, there resulted uniformly a cessation of hemorrhage, and of the fetid discharges in one facial as well as in the fourteen uterine cancers, while the pain was markedly soothed even in patients who had previously been unable to obtain relief from morphine hypodermically. When the injections of the nectrianine were stopped, the troublesome symptoms all reappeared, only to respond again to the same treatment when resumed. Bra and Mongour did not feel justified in deferring operative intervention in order to test their new method in early operable cases, but it would seem to be one well worthy of a further trial on a larger scale.

Treatment of Sarcoma and Benign Tumors.—The treatment of *sarcoma* need differ in no respect from that of carcinoma of the stomach, except that even greater efforts should be put forth to make, at the earliest possible moment, the diagnosis of malignancy, so as to secure operative intervention at the only time when it can be of any possible use.

Riegel advises the administration of arsenic in lymphosarcomatosis, though I do not know of any reports of cases in which it has proved of any avail.

The treatment of the *benign tumors* of the stomach must be almost exclusively surgical. It is not likely that galvanism, which can accomplish so much for such growths in the pelvis, could be employed in sufficient strength within the stomach to be efficient.

In every swelling or apparent tumor of the pyloric region, producing symptoms of obstruction, an operation at the

earliest possible moment is the imperative indication. In certain cases something might be accomplished in a palliative way by dilating the pylorus through the stomach as recommended by Hemmeter; but it is true conservatism here to insist upon radical measures promptly—gastroenterostomy, pyloroplasty, or pylorectomy.

LECTURE LXIII
TUMORS OF THE INTESTINES
CARCINOMA AND SARCOMA

CANCER of the intestines is an infrequent disease, especially in the parts above the rectum. In some large series of cases nearly 90 per cent. of such cancers were in the rectum. It is a singular fact that while carcinomas are much more frequent in the *stomach* than in any other part of the digestive system, and comprise nearly one-half of all cancers found anywhere in the human body, they are least common in the small intestine, and the frequency of their occurrence in the intestinal tube is in direct proportion to the distance below the stomach. The explanation of the fact that cancer so much oftener attacks the stomach and rectum than other portions of the digestive system is that these regions suffer most from irritation—the stomach from indigestible and insufficiently chewed food, and the rectum from the pressure of impacted feces. The other sites where such growths are found with comparative frequency are in the cecum and the flexures of the colon, including the sigmoid, all of these being places where the feces are prone to lodge.

Intestinal cancer seems to be a little more common in men than in women. It is most prevalent in middle and advanced age, as in the case of similar growths in the stomach.

The disease is generally primary in the intestines, but may extend to them by contiguity from adjacent organs, or exceptionally, by metastasis. Sarcoma of the intestines is very much rarer even than carcinoma.

Ætiology.—The origin of carcinoma and of sarcoma is still unknown, and I will not attempt to repeat here all the

guesses upon the subject. There is much evidence, however, going to show that various forms of trauma—direct injury to the tissues or irritation of any kind long continued—predispose to both kinds of malignant neoplasms, especially in persons having impaired constitutions, whether the impairment be inherited or acquired. Infection may also have to do with the production of sarcoma.

Metastases.—Cancers of the intestine are less disposed than those of any other parts, according to Ewald and various other authorities, to spread or reproduce themselves by metastasis, and when this does occur, it is more likely to be late in the case. This is exceedingly important and should encourage you to advise, and even urge, surgical intervention whenever the disease can be diagnosed before it has advanced to a manifestly fatal extent.

Metastasis in these cases is most frequently to the lymph-glands of the peritoneum. Ewald has observed that next after these, the tendency is to involve the liver, and then the peritoneum itself, the lungs, the uterus, etc.; also, that in cancer of the flexures of the colon, the infection tends most toward the lumbar glands, and, in that of the transverse colon, to the omental glands. Such pointers from an exceptionally experienced pathologist and clinician are valuable. The same author cautions us not to forget that the existence of cancer in the bowels does not exclude the possibility of another primary growth of the kind in some other part at the same time. Both sarcoma and lymphosarcoma are almost invariably primary when they involve the intestines, and they are more prone to invade other parts by metastasis than carcinoma.

Pathology.—The several varieties of carcinoma which occur in the stomach or elsewhere may also be encountered in the intestines. The adenocarcinoma predominates. The colloid form is often found in the rectum, and less frequently the pavement-celled cancrioid variety. Again, as in the stomach, intestinal cancer may be hard (scirrhus) or soft (colloid), and beginning usually in the mucosa, tends to develop outwards

TUMORS OF THE INTESTINE

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When the *Journal of the American Medical Association* published a report that the Food and Drug Administration (FDA) had approved a new abortion pill, the *Journal* published a letter from a woman who had taken the pill. The letter was signed "A. M. M." and read:

through the other layers successively. The disease shows a great tendency also to extend itself around the entire circumference of the bowel, producing ring-shaped or sometimes cylindric thickenings, which result in partial or complete stenosis. The intestine above these narrowed parts becomes dilated—often even when the obstruction is not complete—and Ewald has seen, at autopsy, pouches thus produced as large as the stomach. The scirrhus form has a marked tendency to ulcerate with the production of small quantities of pus and blood, which may be found in the stools, and when a vessel is thus eroded, larger hemorrhages may result. Perforation is not infrequently caused by such ulceration, and in this way general peritonitis may be set up, or more commonly when adhesions have attached the diseased intestine to a neighboring structure, local peritonitis develops; or the perforation may produce a fistulous connection between the intestine and the stomach, or other adjacent viscus. Local peritonitis may also result from the extension of the growth through to the peritoneum. The formation of a gastrocolic fistula through the perforation of a cancer, in either the stomach or transverse colon, gives rise to a peculiar group of symptoms, which are described in Lecture LIX.

The *pathology of sarcoma and lymphosarcoma* in the intestines does not differ from that of the same growths as found in the stomach. All the varieties of these tumors may be encountered here, but the small round-celled sarcoma is most frequent. They usually take their origin in the submucosa and extend to the muscular and serous layers of the gut. The lymphosarcoma arises from either the solitary or agminated lymph follicles. The most frequent site of sarcoma is in the duodenum or rectum. It is asserted by numerous authorities that sarcoma of the intestine, in contrast with carcinoma, enlarges by its growth the lumen of the bowel, instead of lessening it; but this is certainly not always the case.

Symptomatology.—Gradually increasing debility, anæmia, cachexia, and emaciation, with usually, but not always loss of

appetite, are general symptoms of malignant growths in any part of the body. Naturally these symptoms do not appear to any noticeable extent at the very outset of the disease. The tumor must have progressed for weeks, and sometimes months, before they have become prominent enough to attract the attention of the patients or their friends. There are not certain to be any symptoms or signs which could lead you even to suspect either a cancer or sarcoma anywhere in its incipency, and in so far as concerns such a tumor in the intestines, it is more likely there, than elsewhere, to run a latent course for a long time.

Pain is the symptom most commonly thought of in connection with malignant neoplasms. Cancer of the intestines is painful, as a rule, but the pain is often quite moderate and tolerable until a far advanced stage, and is often diffuse, referred vaguely to a large part of the abdomen, or to the lower back. It is comparatively seldom limited to the locality of the tumor. It is frequently not persistent, but spasmodic, like neuralgia. In cancer of the flexures, the pain is often felt in the hip joints or loins, but in such cases the pain may change about, being felt sometimes in one place, and again in another. Then, in a certain proportion of carcinomas, and in a still larger proportion of sarcomas of the intestines, no pain may be complained of until very near the end. The pain is often due to adhesions, and to the dragging which results upon adjacent organs, especially during exercise or while massage is being given.

The finding of a tumor by palpation is the chief sign of an intestinal neoplasm. This is rarely possible at an early stage, and when the growth is in certain positions, such as in the flexures, which, with the exception of the rectum, are the most frequent sites of intestinal cancer, you will not often be able to feel it before it has attained to a large size. Tumors of the intestine, except they be in the lowest part of the duodenum, or in the cecum or rectum, or have become attached by adhesive inflammation to some neighboring part, are more or less

movable, and can be pushed from side to side. When they arise from the transverse colon, or its flexures, or from the small intestine, except the third portion of the duodenum, they very commonly pull the bowel down by their own weight into the pelvis after they have attained to a considerable size. In palpating the abdomen, therefore, you should be careful to feel thoroughly every inch of it, including especially the lowest zone. You should never neglect to examine per rectum, and in women per vaginam as well, by bimanual palpation, since in this way tumors otherwise undiscoverable, attached to various parts of the intestine, may be recognized. When rigidity of the abdominal muscles prevents satisfactory palpation, you may need to etherize the patient, but examination in a warm bath will sometimes cause relaxation.

Malignant neoplasms in the intestines after the earlier stages are generally somewhat sensitive to pressure, though by no means always—Ewald says most of them are but slightly so. When there is a local low-grade peritonitis, from a slowly developed perforation, the tenderness will extend for a little distance on all sides from the site of the tumor. Quite frequently in the case of cancer, it has been observed that there is a slight œdema under the surface of the overlying region. The tumor is at first smooth and oval or roundish in form, but the carcinomatous kind are likely soon to become irregularly knobbed, so as to present an uneven surface. Sarcoma is usually smooth and hard throughout, and grows at a phenomenally rapid rate.

The temperature in cancer is rarely above normal, until the growth begins to ulcerate, and is often subnormal. When disintegration is in progress, there may be chills and fever. Fever is more frequently observed in sarcoma.

The stools do not present any uniform appearance characteristic of malignant growths in the bowel, unless pieces of tissue found upon a microscopic examination contain evidences of malignancy; and this does not often happen. Small amounts of pus or blood, or still more, both at once, may

awaken suspicion of a growth, and would be to a certain extent confirmatory in case a tumor could be felt; but the various forms of intestinal ulceration give the same findings.

There may be regular normal evacuations until the lumen of the bowel is so much narrowed that hardened feces, gall stones, or a bunch of worms produces complete obstruction. Not infrequently a persistent diarrhea complicates the disease from first to last, or there may be either constipation or normal stools at times, alternating with diarrhea. In the case of carcinoma, sooner or later obstruction of the bowel nearly always occurs as a result of a gradually increasing encroachment upon its lumen. This is finally closed completely by an obturation from within—most commonly in the form of an accumulation of hard fecal masses or undigested substances in the dilated pouch above. Sometimes such an accumulation may be forced through the stricture once or even oftener, by purgatives aided by atropine, olive oil, or perhaps metallic mercury, but at last the obstruction recurs and cannot again be overcome by anything short of laparotomy.

For some time before the final obstruction suddenly brings such a grave and generally fatal crisis in the case, the stools, when the tumor occupies the colon, may give evidence of the existence of a permanent stricture, by being constantly ribbon-formed, or of lead-pencil size and shape. According to some authors, stools composed of small, hard balls, like bullets (*Schafkoth*) may also point to such a stricture, but such stools as the last mentioned are very common in torpid liver or sluggish bowel—constipation—from various causes. The ribbon-like or pencil-formed stools may occur as a result of spasmodic contractions in certain neurotic conditions (see the description of spastic constipation in Lecture LXIX.), but in such cases the stools will usually be at times of normal size and form, especially after full doses of nerve sedatives, while, when the stricture is due to a tumor, a normal stool is never possible.

Edema of the feet and legs is very commonly present, and

sometimes ascites, during the latter part of a course of a malignant tumor in the abdomen, as a result of the obstructed return flow of the blood. The former symptom often disappears a short time before death. The ascites frequently results from the involvement of the peritoneum in the malignant process.

Distention of the abdomen generally, or of particular loops of the intestines, does not differ in the cases under consideration from the same symptom when resulting from other forms of bowel obstruction. It simply points to obstruction, though the persistent inflation of a certain loop may help to locate the trouble.

Disturbances of digestion may be absent, or at least not marked in tumors of the lower bowel until the disease is far advanced, but even in these cases there generally develop *pari passu* with the cachexia and debility, a falling off in appetite and an increasing difficulty in the digestion of a normal amount of food. Very commonly there is a distaste for meat; often also nausea and vomiting as well as the diarrhea already referred to. When the tumor is in the small intestine, especially if near the stomach, the obstruction resulting tends to produce gastrectasis with its peculiar train of symptoms, the same as when it involves the pylorus. In most of the cases associated with failing or absent appetite, the gastric juice will be found very deficient in HCl, and often in the ferments as well.

A malignant tumor of the colon causes more disturbance of the bowels, flatulence, colic, etc., with generally constipation, or an alternation of this with diarrhea.

Cancer of the rectum, the most frequently encountered of intestinal neoplasms, is considered in the special lecture on Diseases of the Rectum and Anus, but will be referred to here briefly. In this region you have the very great advantage of being able to make a certain diagnosis, both by the touch and by sight, with the help of a good speculum. The pain of both cancer and sarcoma here is usually worse than in

those higher up in the bowel, and is increased during defecation. Tenesmus is also a marked, and often a most distressing symptom. When the tumor is not recognized in time, its ravages by direct extension to the adjacent pelvic structures are likely to be serious, but fortunately metastasis does not, as a rule, occur early, and when the patient applies for medical



FIG. 81.—Ulcerating carcinoma of the rectum with the formation of pouches and sinuous invaginations of the mucous membrane. (After Quénu et Hartmann.)

advice reasonably soon, the diagnosis should be made promptly enough to warrant hopeful treatment.

The symptoms of intestinal sarcoma differ from those of carcinoma by (1) the much greater energy and rapidity of its

growth; (2) the very much greater size to which it may attain, notwithstanding that it kills so much more quickly; (3) the markedly rapid development of cachexia, debility, and the other signs of constitutional involvement; (4) the far shorter duration of life after the disease develops (usually less than a year); (5) the comparatively great rarity of intestinal hemorrhage during its course; (6) the infrequency of any resulting intestinal obstruction, in consequence of the fact, stated by most authors, that it causes dilatation rather than contraction of the bowel at the point attacked, and (7) the almost uniformly smooth surface of the tumor itself.

In addition to the foregoing important and well-defined differences, Boas mentions also, as of possible value, the early development of ascites in sarcoma, and irregular—sometimes regular—fever in the same disease.

Regarding sarcoma of the rectum, its objective symptoms or signs differ decidedly from those of carcinoma of the same region in two noteworthy respects: (1) The tumor can be felt as smooth and not nodulated; and (2) ulceration or disintegration, which nearly always speedily develops in epithelioma everywhere, is commonly absent in sarcoma of the rectum, and this can be quickly determined positively by a digital examination.

Course and Complications.—The duration of cancer of the intestines is longer on the average than that of the same disease elsewhere—often three or four years when uncomplicated. It begins very insidiously and pursues a comparatively latent course in many of the cases. Besides such frequent accidents as intestinal hemorrhage, diarrhea, etc., cancer here finally always invades the peritoneal layer of the bowel, and then there may result any one of a variety of complications—local peritonitis with adhesions to any adjacent organ or other intestinal coil; perforation with a resulting localized abscess or general peritonitis. By such perforations fistulas may be established between the loop of intestine involved and some neighboring one, with the stomach (as in gastrocolic fistula),

with the bladder, gall bladder, etc. Or in the same way a fistulous opening may occur through the abdominal wall. Œdema of the lower extremities or effusion into the peritoneal cavity—ascites—may occur.

When operative intervention is not invoked sufficiently early, cancer of the intestines most frequently effects its fatal result by causing obstruction of the bowels, with the consequent autotoxæmia and almost incessant vomiting. In the absence of obstruction death comes from exhaustion as a result of the toxæmia, and often in coma—*coma carcinomatosum*.

In cancer of the duodenum or jejunum, as in pyloric cancer, death results much sooner than when its seat is lower in the alimentary canal, since digestion is seriously embarrassed, and nutrition suffers more.

Sarcoma, in both its forms, runs a rapid course in the intestines as elsewhere (though a very rare disease there) and does its fatal work within nine months or a year—often in less time. Kundrat of Vienna, whose experience has been largest in this disease, and whose figures all authors cite, insists that it does not generally cause any stenosis of the bowel, but the opposite condition of dilatation. All its characteristic phenomena, already referred to, develop much more quickly than in the case of carcinoma.

Diagnosis.—The differential diagnosis between carcinoma and sarcoma in the intestines (unless the tumor is in the rectum) can rarely be made at once, when the case first comes under medical oversight. But after any doubtful tumor has been carefully observed for a few weeks, it ought usually to be possible to decide which form of tumor is present from the rate of growth, the feeling of it, the degree of development of cachexia, etc., and by the other differences mentioned under the head of Symptomatology. This is an important diagnosis to make, since surgical intervention is generally to be urged in intestinal carcinoma, except when metastases are demonstrable, but rarely advisable in sarcoma after a tumor is

clearly palpable, for the reason that other parts are then almost certain to have been already attacked by it.

You may certainly diagnose cancer or sarcoma of the intestines, only when you can either find the elements of such a growth in the stools along with some other decided symptom or sign of the same, such as a tumor or steady loss of flesh, strength, and color in spite of remedies which should have checked such a tendency, or find a tumor connected with the bowel, together with such marked symptoms of failing health as above mentioned, especially when there are also symptoms of gradually increasing intestinal obstruction, pointing then to carcinoma.

Finding any of these symptoms alone, or even all of them without being able either to make out a tumor, or discover the elements of a malignant growth in the stools, should render you suspicious and watchful, but cannot be decisive. Various other conditions, such as a stricture from a healed ulcer, chronic appendicitis, adhesions, twists, and other causes of intestinal obstruction might produce similar symptoms.

To determine in what part of the intestines a tumor is situated, you may, in any case which has not progressed so far with disintegration as to endanger a rupture, inject carbonic dioxide, air, or a warm weak saline solution into the colon. These, in case of a complete occlusion of the intestine by the tumor, will be arrested at the site of the latter. In any case, the injection of air or gas will distend the colon, and thus help you by means of percussion to determine more nearly the location of the growth when it is in the large bowel. This would aid little, however, in fixing the location of a tumor of the small intestine, except by exclusion. You will need to differentiate between a malignant neoplasm of the bowel and the following especially: a hard fecal tumor; a kidney fixed in a wrong place; a benign tumor connected with one of the pelvic organs, intestines, or other abdominal viscera; an encapsulated peritoneal exudation; a tuberculous growth in, or adjacent to, the

bowel; actinomycosis in, or near, the same; a scar and thickening which may have resulted from a healed ulcer of any kind, whether syphilitic, tubercular, dysenteric, or as a complication of chronic intestinal catarrh or typhoid fever.

To discuss here *in extenso* the diagnosis of a malignant tumor of the intestines from each of the above-mentioned conditions, would require more space than is at my disposal. But with regard to most of them the diagnosis is easy, since the steadily increasing cachexia, debility, etc., of cancer are almost never present in any of them, except possibly those involving tuberculosis, and this could be differentiated quickly by the tuberculin test (see Lecture LVI.). Actively progressing syphilis, too, might mislead, but this would speedily respond to the fullest practicable doses of the iodides.

To decide whether a growth in the cecum is carcinomatous or tubercular is sometimes very difficult, and Boas, in his "Darmkrankheiten," has given the following tabular statement of the differential diagnosis between the two conditions:

DIFFERENTIAL DIAGNOSIS BETWEEN TUBERCULOSIS AND
CARCINOMA OF THE CECUM

	<i>Tuberculosis of the Cecum.</i>	<i>Carcinoma of the Cecum.</i>
<i>Age.</i>	Generally in the second to fourth decade.	Seldom before the fourth decade.
<i>Duration.</i>	Very chronic.	That usually of cancer generally.
<i>Lungs.</i>	Often show more or less decided tubercular processes.	Negative.
<i>Tumor.</i>	Shows a marked extent in length; also the bowel itself, in consequence, can be felt as an infiltrated organ.	Is sharply circumscribed and usually limited strictly to the cecum. This cannot be palpated as such at all.
<i>Signs of Stenosis.</i>	Always present and distinguished by decided sounds.	May be wholly wanting. If present, less markedly audible than in cecal tuberculosis.
<i>Stools.</i>	Contain blood and pus very seldom, but often tubercle bacilli.	Blood and pus not rarely observed. Tubercle bacilli never found.
<i>Fever.</i>	Not seldom present.	Exceptional.
<i>Urine.</i>	Shows Ehrlich's diazo reaction.	Always fails to show the diazo reaction.

Other Diagnostic Points.—Fecal tumors have often been confounded with malignant growths, and the diagnosis is sometimes impossible at first, or till after a patient use of aperients, especially oil and warm saline solutions by enema, has had time to soften a fecal mass, as well as to diminish its size, and often to change its position.

When the fecal tumor has not by long pressure inflamed the adjacent mucosa so as to be very sensitive to pressure, and at the same time is not very hard, the diagnosis can sometimes be made at once by denting it with the finger through the abdominal wall, or even breaking it in two; but this is very often impracticable. Then the only way is to administer purgatives or enemas and await results.

Another rather difficult condition to differentiate from an intestinal cancer or sarcoma, and yet one in which it is very important to be able to make the diagnosis, is that in which one of the kidneys—usually the right one—has been displaced and become fixed by inflammatory adhesions in an abnormal position, especially in the case of a much weakened and emaciated patient, with, as not infrequently happens, Bright's disease developing as a complication. Here, the surest help to the diagnosis would be a radiograph. But careful palpation in the gentlest manner, when the tumor can be plainly felt, should reveal the peculiar kidney form when it constitutes the tumor. Furthermore, the pallor of simple anæmia or of Bright's disease is different from the yellowish dirty-white of cancer. Then a patient with a misplaced kidney, plus Bright's disease, or neurasthenia, will generally improve when put to bed and carefully fed, but not often with cancer or very temporarily, when the loss of flesh and strength will again progress.

It is frequently still more difficult to diagnose cancer or sarcoma of the intestines from a like tumor of some other abdominal organ, but this is far less important, except for the purposes of prognosis. In so far as regards treatment, it makes comparatively little difference what particular abdominal structure is involved. If the tumor should be far advanced,

speedy death would be inevitable anyway; and if it were recent, with the patient in fair condition, an exploratory incision would be desirable in any event unless the growth occupied one of a very few situations, such as the cardiac orifice of the stomach, the liver, the pancreas (except impracticably early), and possibly one or two other viscera, or parts of viscera, which the surgeons would not risk invading. To reach a diagnosis, which should exclude a tumor of one of these parts, is generally quite possible from the symptoms and the results of a thorough examination.

Prognosis and Treatment.—It is still generally admitted that there is no sure remedy for either carcinoma or sarcoma, but that the surest is very early removal by the knife. This is doubtless true when the tumor is in a safely accessible situation and when both the diagnosis can be made, and consent to an operation obtained, at a very early stage of the disease before any metastasis or glandular involvement has occurred. But several rivals of the knife are now coming forward in this field. One of them is Massey's semi-surgical method of driving into the diseased tissue certain caustic metallic salts by the help of colossal doses of the continuous current (galvanism) under anæsthesia. This method is described in its discoverer's own language in Lecture LXXIX.

Massey claims exceptional success for this method, and reports numerous cures effected by means of it in cancer of the rectum and in other accessible cavities. Some few other physicians also are reporting well of it, and it deserves to have a thorough test in some large hospital under exact conditions. Cures of several years' standing are said to have followed its use in a number of cases of malignant growths which were inoperable, as well as in other less serious forms of cancer, and it ought to be easy to determine the accuracy of the claims made in its behalf.

The x-ray, violet ray, Finsen light, radium, etc., have all been employed of late, and some of them, with alleged success, in malignant tumors of the rectum, as well as in other

cavities of like easy access; in cancer of the breast and uterus, and in innumerable morbid growths of the skin. These methods seem to be full of promise, and I have fully discussed their possibilities, and given reports of cases treated by some of them in Lecture LXII. on The Treatment of Carcinoma and other Tumors of the Stomach.

The approved surgical operations in malignant intestinal neoplasms are, (1) when there is hope of extirpating the disease altogether, an excision of that part of the gut which includes the growth, followed by an end-to-end anastomosis of the severed parts of the bowel, and (2) when this is no longer possible, avoidance of further irritation of the diseased tissues by joining a healthy loop of intestine above to another below (entero-enterostomy or entero-colostomy), and then making an opening between them; or when the tumor is high up in the small intestine, the same object may be better obtained by attaching a loop of intestine below it to the stomach—gastro-enterostomy. (3) When the tumor is in the rectum, or lower part of the colon, and none of the above operations is practicable, the establishment of an artificial anus in the colon (colostomy) may still be done with the prospect of prolonging life thereby.

In Lecture LXXIX. the various procedures practicable in malignant disease of the rectum are discussed.

The palliative treatment of malignant neoplasms in the intestines does not differ essentially from that of cancer of the stomach as described in Lecture LXII. just mentioned. When the bowels are loose, the methods described in the Treatment of Diarrhea—Lecture LXXI.—will be applicable; and when there is constipation the very full account of the best methods of overcoming it, as described in Lecture LXX.—especially the employment of oil, both by mouth and by enema—will stand you in good stead.

When the bowels are becoming obstructed by a tightening stricture, caution needs to be used in the administration of the stronger cathartics, since these may sometimes do serious

harm. Lashing the intestines to greater efforts may produce a rupture of the dilated pouch above the stricture and speedy death.

When, in such a case, operative intervention is impracticable, the better plan is to depend upon liquid diet, aided by nutritive enemas, and give olive oil freely when it is well borne, or if not, liquefy the feces by a cautious employment of the purgative salts, or natural waters.

BENIGN TUMORS OF THE INTESTINES

Other neoplasms than cancer and sarcoma rarely occur in the bowels, except in the form of small polypi which cannot be recognized and seldom produce symptoms. The different varieties which may develop there are cyst adenoma, (which is the predominant kind,) fibroma, lipoma, myoma, and angioma. When any of these are attached to the mucosa by a distinct pedicle they constitute polypi. They do not often give rise to any derangement of function, except that, when large, they sometimes cause bleeding. Occasionally, too, they have been a cause of intussusception. Small growths or excrescences of these kinds are sometimes very numerous in certain portions of the intestines, especially in children.

The most common form of them is the adenoma. This takes its origin in the mucosa, is prone to occur in groups, and is aciniiform in structure.

Treatment.—When benign tumors of the intestines give rise to hemorrhage which cannot be controlled by astringents, laparotomy is necessary, as it may be also, occasionally, for obstruction or intussusception (invagination) from the same cause. Such tumors are most frequently encountered in the rectum, and are there more amenable to treatment than elsewhere. (See Lecture LXXIX.)

LECTURE LXIV

INTESTINAL OBSTRUCTION

THE above term is here intended to include both complete and partial obstruction of the intestine. There may be (1) a complete occlusion of the bowel, otherwise known as ileus, in which neither ingesta nor flatus can pass through the affected portion, because of either a mechanical impediment or a paralysis of the propelling muscles, and (2) a stenosis or stricture which produces a narrowing or partial or intermittent obstruction of the intestinal lumen, so as to delay or embarrass without preventing altogether the passage of both feces and gases.

Classification.—Most authorities divide all forms of obstruction into acute and chronic, and there are good reasons for this, though, generally, whenever there is complete occlusion, the obstruction is accompanied by acute symptoms, and when the clinical picture is rather that of a subacute or chronic process, it is usually because the obstruction is not complete. Exceptionally, however, complete obstruction may come on very gradually, and then present, for a time, no acute symptoms; and when partial obstruction is accompanied by a sudden stoppage of the circulation, acute symptoms will appear.

Tuholske¹ divides intestinal obstruction into (1) *congenital*, and (2) *acquired*, and the acquired form into (a) *dynamic*, or paralytic, and (b) *mechanical*.

The congenital forms usually present no difficulty in diagnosis, because the most common varieties are those due to an imperforate anus, or imperfect development of the colon in some of its parts, deformities which are comparatively easily

¹ *Jour. Amer. Med. Assn.*, February 27, 1904.

recognized, and those due to constrictions of the bowels from intra-uterine peritonitis, which are commonly fatal before the necessity for diagnosis arises.

The classification here followed is in part that adopted by Tuholske, and in part my own.

DYNAMIC OBSTRUCTION

This is that form due to paralysis or paresis of the intestinal walls, whether from inflammatory, nervous, or reflex causes.

Chief among the causes of dynamic obstruction is peritonitis, either general or local. It is in marked contrast to mechanical obstruction, which is itself a cause of peritonitis. Thus there might conceivably be a dynamic obstruction in one portion of the intestine caused by a mechanical obstruction in another, this result being brought about through the agency of the peritonitis set up by the latter.

Other causes are various infections of the intestinal canal which are not sufficiently virulent to result in a peritonitis. They include great accumulations of gas, and various traumatism, especially operations upon the genital organs or intestines, compression of a testicle, and the replacement of hernias, which, according to some authorities, may sometimes reflexly produce a paralytic obstruction.

Still other causes are certain lesions of the central nervous system producing paralysis or paresis of the intestines, hysteria, and powerful irritation of the peritoneum of any kind, either chronic or mechanical.

Embolism or thrombosis of the superior mesenteric artery constitutes a rare cause of ileus, but one which produces a very early gangrene of the affected segment. The destruction of tissue is so rapid that the intestine is usually dark, friable, and gangrenous before the patient comes to operation. Individuals in whom it occurs have some endocardial disease, which may show itself by a murmur at the apex. According to the experiments of Deckart, the reason for the rapid march of the gangrene is to be found in the fact that the vessels of the in-

testinal walls are in a sense like end arteries. While there is a rich anastomosis between the vessels of the walls of the small intestine, yet the connecting branches are very small, and after the lodging of an embolus the blood pressure is so low that an infarct is formed, and the tissue breaks down before the collateral circulation can be established. Fortunately this accident is very rare, not many cases having been reported.

The Symptoms of Dynamic Obstruction.—Since the various causes of intestinal obstruction differ so widely from one another, and since many of them present distinctive symptoms which are peculiar and not common to the others, it will be best to describe separately under each group of ætiologic conditions its characteristic symptomatology.

Symptoms of Intestinal Obstruction Generally.—Let me premise, however, that in every case of complete obstruction of the bowels, there is obstinate constipation—obstipation. There also develop, sooner or later, the inevitable consequences of such a condition, viz., pain, vomiting, which in time becomes fecal, and great tympany or meteorism. There will also be found, as a rule, indicanuria, and a marked leucocytosis. Unless relief comes within a comparatively few days, the time depending upon the vitality of the patient, the part of the intestines obstructed and the extent of the traumatic injury involved, death ensues either from shock or from septic poisoning, starvation, and exhaustion. Within a few hours often after the pain and vomiting have become severe, the patient will be very pale, with pinched features, a haggard, anxious expression, and a very restless manner, while the pulse in most cases will be weak and rapid, rarely under 125 or 130, and often much higher—150 to 160.

The symptoms of ileus due to acute peritonitis, either local or general, are, in addition to those above mentioned which are common to all forms, the following, which are characteristic of the inflammatory affection itself.

Besides acute spontaneous pain, there is very marked pain on pressure, the affected part of the abdomen becoming ex-

quisitely tender. Vomiting is nearly always an early symptom. When general peritonitis exists, the patient remains almost immovable, lying on one side or in the dorsal decubitus, with the knees drawn up to prevent the pressure of the bed-clothes, and breathes in a shallow way to avoid the increased pain that a deep depression of the diaphragm would cause. In this form of the disease, too, the pulse is rapid, usually 120 to 150 to the minute, very small, and often thready. There is fever in nearly all cases, though exceptionally this may be absent in some of the gravest cases, and in spite of the usual high central temperature, especially in the rectum, the skin, of the extremities particularly, is generally cold and clammy.

In general peritonitis, after a short time, an effusion takes place, and liquid may be demonstrated in the abdominal cavity in dependent positions. When there has been perforation into the peritoneal cavity, the hepatic dullness disappears in the mammary line, and may be absent in other cases of obstruction in consequence of coils of intestines having been crowded up over the liver.

The Symptoms of Dynamic Obstruction from other Causes.—These do not call for extended description. When a compressed testicle, operations upon the intestines, attempts at replacement of a hernia, etc., reflexly produce paralysis or paresis of the bowels, the symptoms are less violent as a rule. When the cause can be removed, they usually do not persist long, unless the traumatism has set up peritonitis.

When disease of the central nervous system or hysteria produces a paralytic ileus, the symptoms are those of the ætiologic affection plus those of obstruction in general. Great accumulations of gas, from autoxæmia or other infections short of peritonitis, give rise to a paresis of the bowel which is usually mild in comparison with those which result from either peritoneal infection, or any of the mechanical causes. Pain, more or less stubborn constipation, anorexia, debility, and anæmia, with occasional, but not often persistent or vio-

lent vomiting, complete the picture in such a form of obstruction in which the parent trouble can be remedied.

The symptoms of a mesenteric infarct are a very sudden development of the clinical complex characteristic of ileus generally, with at first large, ill-smelling stools, which are dark and tarry from their contained blood. There are, also, acute, severe pain, great sensitiveness to pressure, vomiting, etc., the usual symptoms of peritonitis, which grow very rapidly worse. In addition there is generally an exudate into the peritoneal cavity, which gravitates into the flanks, and often besides, symptoms of a concomitant endocarditis. Death often closes the scene before fecal vomiting has occurred.

MECHANICAL OBSTRUCTION

The mechanical varieties of intestinal obstruction shall be here divided as follows:

1. *Intussusception*, the most frequent cause, which usually produces both (*a*) strangulation by a compression of the mesentery as well as of the vessels in the bowel itself, thus cutting off the circulation of the part, and (*b*) obturation, the segment of gut which forms the *intussusceptum* acting as a plug and closing the lumen more or less completely. Intussusception thus usually produces both strangulation and obturation.

2. Those forms in which there is sudden occlusion of the intestine by some kind of *external strangulation*, as in *volvulus*, or torsion of an intestinal loop; the *strangulated hernias*, whether, through the usual openings in the abdominal wall into slits of the mesentery, omentum, etc., or behind a persisting Meckel's diverticulum whose free end has become adherent to some adjacent structure; and *knotting* of a portion of the intestine by long peritoneal bands.

3. Obstruction by any one of various outside agencies as follows: A sharp *flexure* in the intestine from the downward displacement of the stomach or a portion of the intestine itself; the *pressure of neoplasms* attached to the outer wall of

the gut, or to some neighboring structure; and the *pressure of displaced organs*, such as the kidney (especially the right one), the liver, uterus, ovaries, etc.

4. *Obturation by gall stones, intestinal concretions (enteroliths), accumulations of worms, foreign bodies* which have

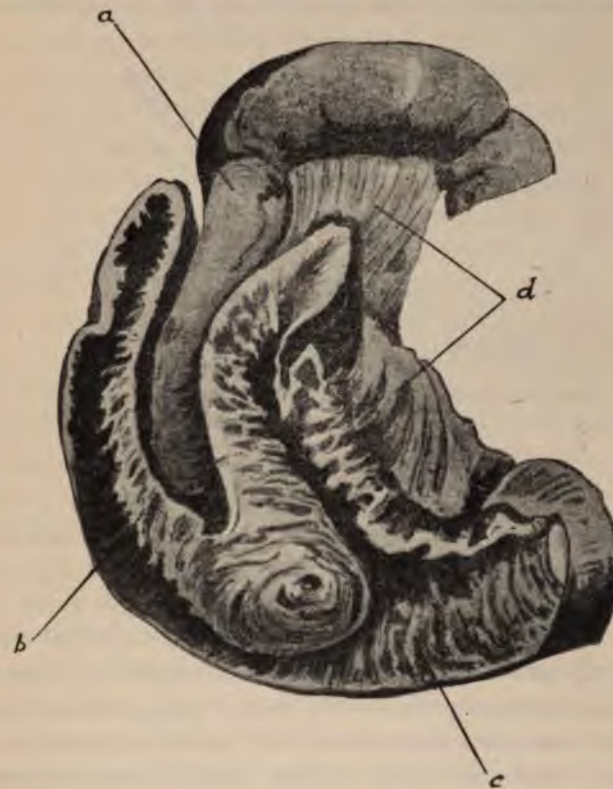


FIG. 82 —Intussusception of the jejunum; *a*, internal; *b*, intermediate; *c*, external cylinder; *d*, mesentery.—(From "Klinik der Verdauungskrankheiten," von Prof. Dr. C. A. Ewald.)

been swallowed, masses of *hardened feces*, *polypi* growing from the intestinal mucosa, and exceptionally other benign tumors inside the bowel.

5. *Strictures* or stenoses which may result from the *scars*

of *ulcers*—peptic, syphilitic, tubercular, dysenteric, or catarrhal—and from *carcinoma*, which last usually causes an annular infiltration of the bowel wall, with a gradual thickening of the latter, and a consequent narrowing of the lumen.

The conditions described in 1 and 2 usually develop acute symptoms which may come on very rapidly, though intussus-

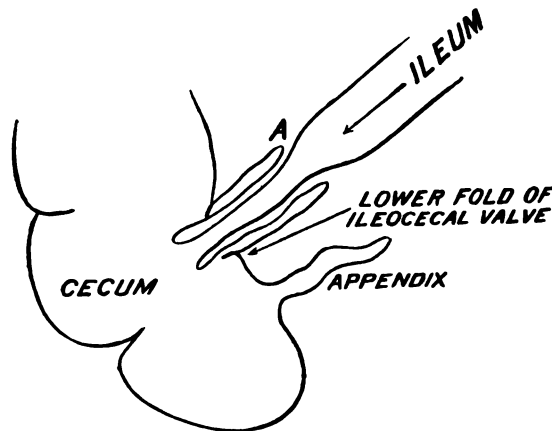


FIG. 83.—Ileocolic intussusception. *A*. Point at which invagination began.

ception sometimes fails to produce complete occlusion, and may set up a chronic condition, in which there are occasional acute exacerbations. Those described under 3 and 4 may, or may not cause acute obstruction with violent symptoms. The conditions mentioned under 5—the stenoses and strictures—generally come on gradually, and the symptoms of obstruction are rarely acute till late in the case, after mild disturbances, pain, constipation, etc., slowly increasing, have long given warning. They will, therefore, be considered under the head of Chronic Obstruction.

Intussusception.—The most common cause of mechanical obstruction is intussusception. This may be classified into two chief varieties, enteric and colic. An enteric intussusception is

a condition in which one portion of the small intestine has prolapsed or telescoped into another part of the same. A colic intussusception presents a similar state of affairs, except that the invagination is limited to the colon, and the small gut plays no part therein. There may also be a mixed variety in which the small bowel prolapses into the larger, producing a subvariety of enteric intussusception.

There are two chief forms of this subvariety: viz., *ileocolic* and *ileocecal*. By the term ileocolic is meant an intussusception which begins in the small bowel and protrudes through the ileocecal valve into the colon. This condition is illustrated in Fig. 82. An ileocecal intussusception might be considered as only a subvariety of the ileocolic, and is one in which the beginning of the intussusception was at the ileocecal valve. That is to say, the first part to prolapse is the valve, which drags after it a portion of the ileum. It is probable that many cases diagnosed as ileocecal are really not intussusceptions in which the site of the primary invagination is the ileocecal valve, but, as has been shown by Corner,¹ the original difficulty was located at some point just above the valve in the wall of the ileum, and this primary invagination is lost sight of as it passes through the valve into the colon. In this form the primary invagination may unroll itself as it passes into the cecum. Many intussusceptions are double, *i. e.*, the first *intussusception* and *intussusciens* together form a new *intussusceptum* for a second invagination. Corner believes that about 80 per cent. of all intussusceptions are double, and an analysis of his observations tends to confirm his conclusions. It is easy, for instance, to overlook a primary enteric invagination, beginning close to the valve and unrolling itself into the cecum as it progresses. This fault in observation would greatly decrease the number of double intussusceptions reported. The table of the varieties of intussusception given by Corner is well worth study, and is here reproduced in full:

¹ *Brit. Med. Jour.*, October, 1903.

Variety	Probable Frequency	Definition
Single.		
1. Enteric .	Uncommon.	Small gut into small gut.
2. Ileocolic .	Rare by itself.	Enteric through valve.
3. Ileocecal .	Uncommon.	Originates at valve.
4. Colic . .	Probably most common single intussusception.	Large gut into large gut.
Double.		
1. Double-enteric .	Rare.	Enteric into small gut.
2. Ileocolic-colic . .	Most common of all.	Ileocolic "impacted" in valve, cecum invaginated into colon.
3. Enteric-ileocolic .	Very rare.	Double enteric with one part prolapsed through valve.
4. Enteric-ileocecal .	Second most frequent variety.	Enteric pushing valve in front of it.
5. Ileocecal-colic . .	Very rare.	Colic into large gut.
6. Double-colic . .	Rare.	Colic into large gut.
7. Colic-ileocecal . .	Fairly common.	Caput coli or cecum invaginated first blocking the valve, this causing ileocecal intussusception.

Intussusceptions of the appendix are, of course, to be classed with those beginning in the caput coli and are probably quite rare. The only case in which any cause for an invagination of the appendix could be found was reported by Rolleston, and is quoted in Corner's paper. In this case there was a prolapse evidently started by a concretion present in the appendix. This had probably caused an exaggerated peristalsis.

Intussusception of Meckel's Diverticulum.—This is of rare occurrence, and some of its varieties might very properly be classified with hernias. Accordingly as the diverticulum is or is not connected with the umbilicus, there will be possible two quite distinct accidents. If the diverticulum is attached only to the bowel, it may become invaginated into the ileum in very much the same manner as the appendix is inverted into the cecum. This accident is only rarely possible because Meckel's diverticulum, when present, is nearly always attached to surrounding structures, a circumstance which would entirely prevent its invagination into the ileum. The cases in which this variety of intussusception has occurred usually

gave histories of subacute disturbances followed by an acute attack, which last was due to an acute secondary intussusception of the ileum caused by the small gut grasping the inverted

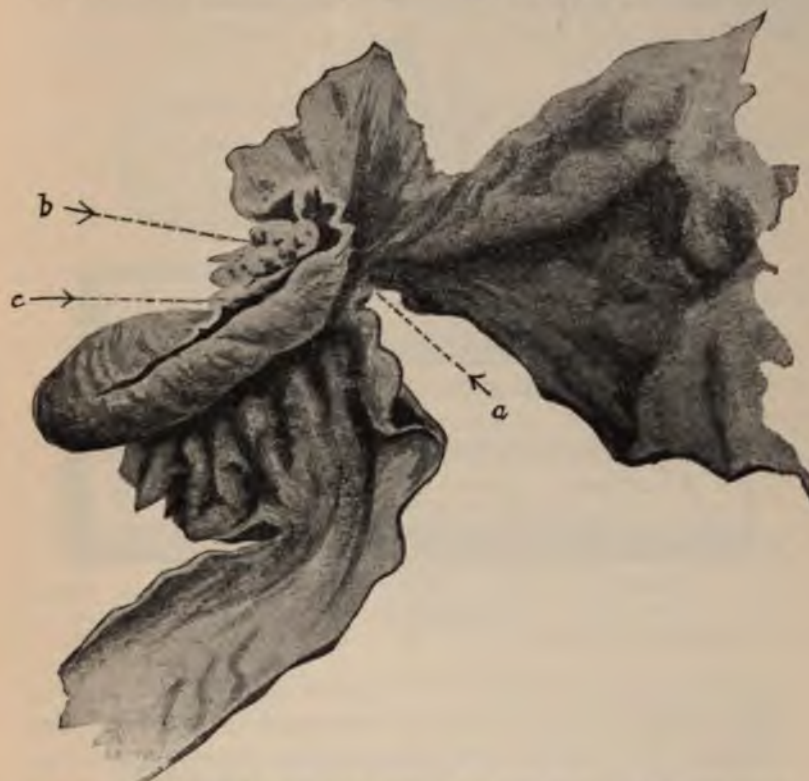


FIG. 84.—Invaginated Meckel's diverticulum, with stenosis and perforation of the small intestine; *a*, cicatricial contraction with perforation; *b*, mesentery of the diverticulum which has been in part retracted into the latter; (*c*) diverticulum after it has been everted ("evaginated") and opened with a longitudinal incision. Length, 9cm.; circumference, 7.5 cm. Diameter of intestine above the stenosis, 14.5 cm.; below, 5cm. (From "Krankheiten des Darms u. des Bauchfells," von Prof. Dr. C. A. Ewald.)

diverticulum and thus invaginating its own wall. In a few instances the process was acute from the start. In either case, an accurate diagnosis is impossible. The mode in which this ac-

cident happens is shown by the accompanying diagram. Fig. 85 (a) and (b).

The secondary intussusception of the ileum will be produced by dragging on the inverted diverticulum, and, from the fact

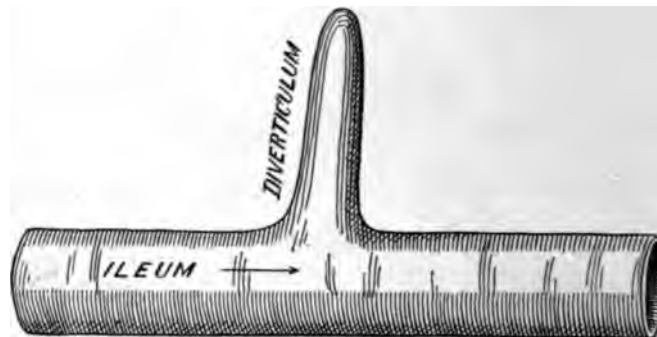


FIG. 85.—(a) Ileum with Meckel's diverticulum before invagination.

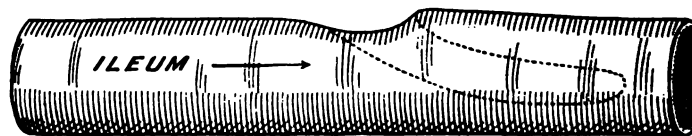


FIG. 85.—(b) Meckel's diverticulum invaginated into the ileum. Dotted line shows position of invagination. Arrows indicate direction of peristalsis.

that the pull is exerted on one side of the ileum only, the ring surrounding this secondary intussusception will be obliquely disposed with regard to the circumference of the bowel. This is best explained by the annexed diagram (Fig. 86).

In the cases in which the process is connected with the umbilicus, the intussusception takes place in the opposite direction toward the umbilicus. Under these circumstances, there are three different accidents which may occur: (1) The diverticulum may be telescoped into its own lumen, as is shown in the figure below (Fig. 87).

After a time the posterior wall of the ileum (at C) may be drawn into the grasp of the diverticulum and a double intussusception produced, as in the annexed figure (Fig. 88).

Under the conditions illustrated in Fig. 88 there would be an umbilical tumor, from the center of which feces would be extruded.

(2) The second case, illustrated in Fig. 89 (*a*) and (*b*), is one in which the first part of the prolapse is the posterior wall

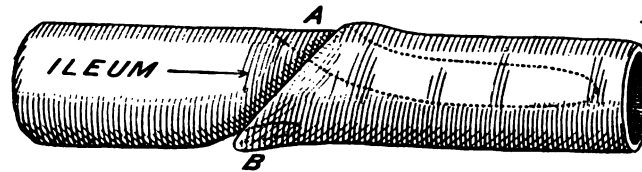


FIG. 86.—Secondary intussusception of ileum due to invaginated diverticulum. *B*. Place where wall of bowel is pulled in, forming the oblique constriction ring *A*, *B*.

of the ileum and when this intussusception has proceeded far enough the diverticulum may telescope into its own lumen, producing a final result similar to that in which the starting

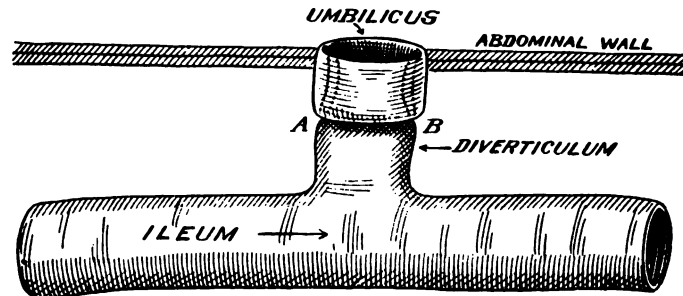


FIG. 87.—Meckel's diverticulum invaginated into its own lumen. The constricting line is showing at *A*, *B*.

point was in the wall of the patulous process and the posterior part of the ileum was pulled in afterward.

(3) The third accident which may occur (shown in Fig. 90) is that an invagination may begin in the bowel above the diverticulum, and, instead of passing down toward the ileocecal valve, finds its way to the umbilicus by way of the open Meckel's diverticulum.

It will readily be seen that, under these conditions, there will be at first a few bowel movements, and later none at all, because all the feces will be sidetracked in the direction of the arrow *A*, and will escape at the umbilicus from the center of

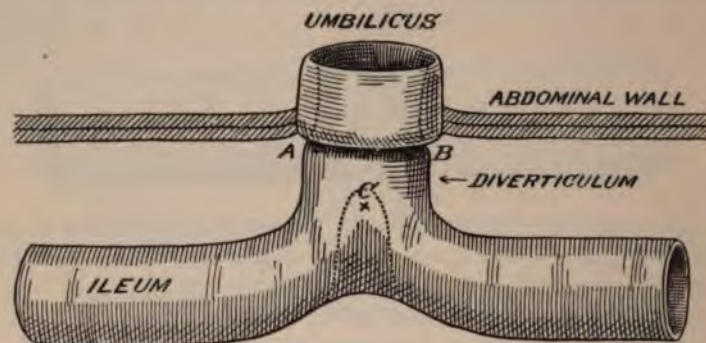


FIG. 88.—Meckel's diverticulum invaginated into its own lumen and posterior surface of ileum also invaginated into the same. The line *A, B*, shows the lower limit of the intussusciptions. *C*, Point on posterior surface being drawn into the diverticulum.

the tumor. As in other instances, this intussusception may remain single, or a second one may take place, implicating the walls of the diverticulum.

Clinically pathologic states of Meckel's diverticulum are not frequently encountered; but a patulous condition of the process is found in nearly two per cent. of all bodies in the dissecting room.

A weak constitution with flabby muscles, as well as the presence of benign tumors or polypi in the intestine, predispose to the production of intussusception.

The symptoms of intussusception include those common to most forms of acute obstruction already described, and when the obstruction is complete, as in the more marked invaginations, you will observe the symptoms which always follow a strangulation of a portion of intestine from any cause. The patient is suddenly seized with severe pain in the abdomen referred generally to the region of the umbilicus, or when the

trouble is in the colon, it may be localized at first at the site of the obstruction. Almost simultaneously with the pain there occurs vomiting which is a reflex from the traumatism,

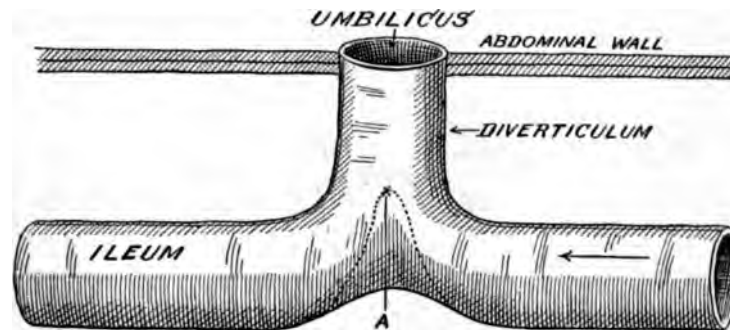


FIG. 89 (a).—*First stage.* A, Point on posterior wall of ileum where invagination begins.

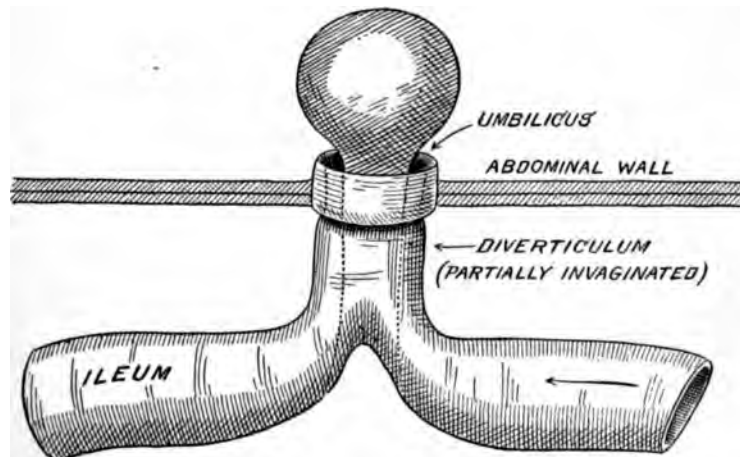


FIG. 89 (b).—*Second stage.* A, Point on posterior wall of ileum which is now protruding from the umbilicus.

and thus differs from that which results later in the disease from an accumulation of ingesta and secretions in the alimentary canal above the obstruction. There are usually evidences of shock in the rapid, feeble pulse, clammy skin, and

anxious facies. Distention of the intestines above develops more rapidly than in obturation, obstruction, or even in peritonitis.

In intussusception there is often tenesmus, and in 80 per cent. of all cases frequent non-fecal evacuations containing a little blood, with also generally small amounts of mucus, or

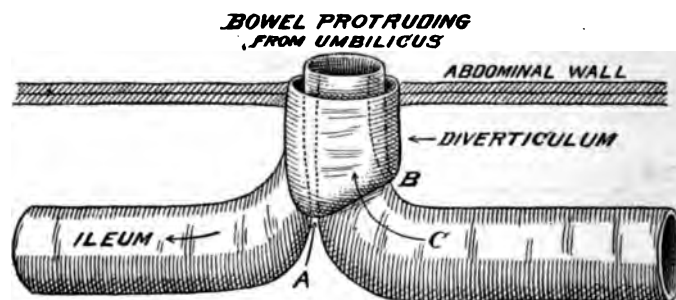


FIG. 90.—Invagination beginning above the diverticulum. Arrow, C, shows direction of intussusception; A, B, line of constriction.

more frequently merely blood-tinged mucus. A sausage-shaped tumor can nearly always be felt, and marked indicanuria is generally present, especially when the small intestine is involved.

Invaginations of the colon, which, like those in other parts of the bowel, are most frequent in children, are more easily diagnosed, as well as treated, than those of the small intestine. Leaving aside those which begin at or near the ileocecal valve, they are usually single. They most commonly contrast with those of the small bowel by presenting less violent symptoms, though this is not invariably the case. The places at which the invagination usually happens are the cecum and the ascending and descending colon. The symptoms do not, in other respects, differ from those characteristic of the disease in the small intestine, except that indicanuria is much less pronounced, as a rule. The prolapsed bowel may possibly be felt in the rectum.

The treatment of intussusception which cannot be reached by

inflation through the rectum is purely surgical, and it is safe to say that it is impossible without operation to treat successfully any intussusception involving the ileocecal valve, or which is located above it.

The treatment of the colic form of intussusception should include the withholding of all food by the mouth, and the administration of enough opiates to inhibit peristalsis. The simplest method of reduction is to inflate the colon with filtered air or some other inert gas. To do this, before the patient is anesthetized, the colon is flushed with about a gallon of water. The patient is then anesthetized and held with the feet up and the head down in as nearly as possible an inverted position. Inflation with the gas is then done by the rectum and will frequently reduce the intussusception in recent cases in which the difficulty lies entirely below the ileocecal valve. It is not always safe to assume that it is so situated when the ascending colon is implicated, since many colic intussusceptions are secondary to enteric invaginations. If, after this method has had a reasonable trial, reduction is not effected, laparotomy should be done without delay. Efforts at reduction made through the incision may then often be successful. If not, either an intestinal anastomosis, an enterostomy, or a colostomy should be performed. After the abdomen has been opened, reduction by manual traction may be assisted by maintaining the inflation of the colon.

Volvulus is due to the twisting of a segment of intestine upon itself or around a neighboring coil, and can occur only in individuals with an abnormally long or relaxed mesentery. It involves most frequently the sigmoid flexure—in over half of all cases.

The symptoms of volvulus are those common to other mechanical forms of intestinal obstruction dependent upon strangulation. A sign which is held by Wahl to be pathognomonic of volvulus is the presence, during the first day, of a circumscribed area of tympany which occurs in the affected segment of the bowel. This is caused by distention with gas. After the

first twenty-four hours this sign is difficult to recognize, because the whole abdomen will then be distended and tympanitic.

The treatment of volvulus is an immediate laparotomy. The affected loop may be readily untwisted in recent cases; but if the bowel shows evidences of beginning gangrene, the loop should be excised and an intestinal anastomosis performed. It is frequently well to take a tuck in the mesentery to obviate the return of the volvulus.

Hernia.—An extended discussion of hernias is out of place here; but since any of them may lead to intestinal obstruction, I will enumerate the varieties, with special reference to the locations in which you should seek for such a cause in any obscure case. The chief varieties are:

1. *Diaphragmatic*, in which the viscus is protruded through the diaphragm, usually at one of the weak points, such as the crura or just behind the sternum where the costal portion joins the sternal.

2. *Umbilical*, in which there will usually be an umbilical tumor. A hernia into a patulous Meckel's diverticulum is a subvariety of this class, and has already been described.

3. *Retroperitoneal*.—This form of hernia occurs in the following places:

(a) Through the foramen of Winslow passing into the lesser sac. (b) Into the phrenico-hepatic fossa located near the left lobe of the liver. (c) A series of three fossæ which have been described in relation with the ascending limb of the duodenum and duodeno-jejunal angle (fossa of Treitz). (d) An intersigmoid. (e) Iliaco-subfascialis, a recess in relation with the left psoas minor muscle. (f) Three fossæ in the neighborhood of the cecum.

4. *Through slits in the mesentery*.

5. *Inguinal*, escaping through the inguinal canal to present at the external abdominal ring. This variety occurs most frequently in males.

6. *Femoral*, which passes along the femoral canal to the

inner side of the femoral vessels and presents on the thigh through the cribriform fascia. This hernia occurs most often in women.

7. *Obturator*.—In this rather uncommon form of hernia, the gut protrudes through the obturator or thyroid foramen of the ileum. In its passage through the foramen the hernia will press upon the obturator nerve which goes to supply the muscles and integument of the inner side of the thigh as far as the knee. This distribution of the obturator nerve explains the peculiar symptom of this hernia; *i. e.*, pain at the inner side of the knee.

8. *Sacrosciatic*, a rare variety in which the viscus protrudes through the sacrosciatic foramen.

The symptoms of hernial obstructions are those typical of strangulation from other causes which are described below.

Strangulation of the Intestines by Knotting, etc.—The bands of adhesion produced by peritonitis may cause obstruction by a fixed kinking or knotting, or in other ways lead to strangulation of loops of the bowel.

Such bands are frequently long, and it is not strange that, during active peristalsis, a loop of intestine sometimes becomes tied or otherwise constricted by one of them, with the result of stopping at once both the passages of feces and gases, and the local circulation in the part. A loop of intestine may become strangulated similarly by being caught behind the appendix or a fallopian tube, when the free end of these has been attached to a neighboring organ by adhesive inflammation.



FIG. 91.—Knotting of loops of the ileum.—(Leichtenstern.)

The Symptoms of Strangulation Ileus.—In such accidents the symptoms are likely to come on abruptly, and with unusual violence. They have been so graphically described by Tu-

holske¹ that I cannot do better than to reproduce here his account of them:

"Having in a given case eliminated the probability of paralytic ileus, and decided that we are dealing with a mechanical obstruction not congenital, the question of strangulation or obturation presents itself. The paradigm, as mentioned above,



FIG. 92.—Constriction of a loop of small intestine by an adhesion attached to the omentum at both ends. (From "Krankheiten des Darms u. des Bauchfells," von Prof. Dr. C. A. Ewald.)

of a strangulation is the strangulated external hernia, or a strangulation of the bowel and its mesentery. The picture of strangulation is a striking one. A person, apparently in good health, is suddenly taken with a violent pain in the abdomen, accompanied by collapse, nausea, and vomiting. To this is very soon added the urgent desire to relieve the bowel of feces and flatus. There is at once the feeling of serious illness, of

¹ L. C.

great anxiety and restlessness. Unrelieved, these symptoms are joined by that of intestinal distention.

"The pain generally felt about the navel is not significant of locality; it is infinitely more severe in the thin, highly innervated small intestine than in the large. The initial vomiting with singultus is reflex and begins with the occurrence of strangulation, and with it also come the signs of collapse, the incarceration collapse, and almost anuria from reduction of the arterial pressure. The vomiting in later stages is due to distention and gas accumulation, the stercoræmia to toxic absorption or septic infection after permeability of the intestinal wall has become established.

"After a few hours, perhaps eight to twelve, the results of the circulatory interference become noticeable; the strangulated section of bowel becomes distended, fixed, and paralyzed, and in favorable subjects, seen early, produces asymmetry of the abdomen and can be made out by inspection and palpation. The afferent loop is not yet appreciably distended; peristalsis may be present. All symptoms increase in severity. To the distention of the strangulated part distention of the proximal loops is added and general greater distention. The efferent intestine has been emptied of fluid and gaseous contents and remains collapsed. To the initial shock, the incarceration shock, after the second day are added symptoms of permeability, due to a changed condition of the gut at the point of strangulation, and symptoms of general peritonitis develop; the vomiting increases in frequency, and the putrid feculent intestinal contents are emitted by regurgitation. The abdomen is tense and tender on pressure, peristalsis everywhere absent; to the signs of stercoræmia are added those of septic infection.

"With the occurrence of gangrene the pain grows less, and the patient enters the stage of lethal collapse. The occurrence of perforation may somewhat modify the latter symptoms. If we add to these local symptoms those of the general condition, the rapid, feeble, compressible pulse, the anxious expres-

sion of countenance, the pale or cyanotic color, the sunken eye, the pointed nose, the skin cold, clammy, and empty of blood, we get the appalling picture characteristic of the result of sudden strangulation."

Treatment of Strangulation Ileus.—In the great majority of these cases surgical intervention is absolutely necessary, and

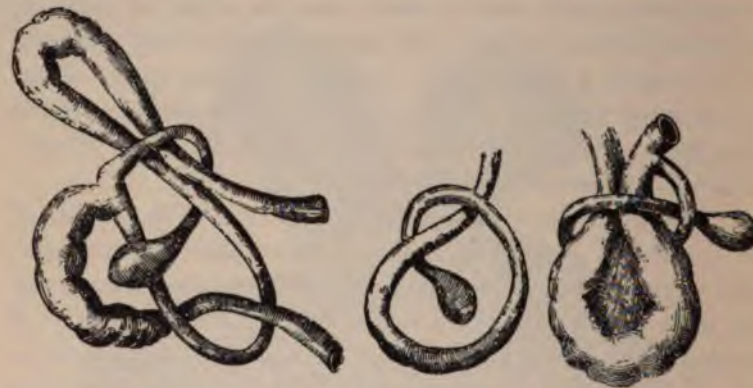


FIG. 93.—Various forms of constriction by a club-shaped diverticulum. (After Regnault-Bèclard and Treves.)

the sooner it is resorted to the better the chances of a favorable result. The mortality from abdominal operations is enormously increased by every day's delay, and in doubtful cases you should have a competent laparotomist in consultation with you at the start.

In hernias, even when strangulated, there is often a possibility of reduction by taxis and the inverted position, but the former is itself really a surgical procedure. It needs to be carried out with skill as well as the utmost gentleness, and should not be prolonged beyond ten minutes, as a rule, when it fails within that time to relieve the strangulated portion of intestine.

Above all do not administer a cathartic by the mouth in this, or indeed, any other form of serious intestinal obstruction, except when there is a probability that it depends upon a fecal stasis. No food should be given by the mouth (and this

rule, too, holds for all such cases) and the patient should be confined strictly to bed. Morphine should be administered in sufficient doses to control the pain and effect the utmost possible relaxation. Anæsthesia by ether or chloroform will often greatly assist manual replacement, but, as a rule, should not be produced until a surgeon is at hand to open the belly if found necessary. An ice bag should be applied locally over the affected region, or, in some instances, a hot poultice or hot wet compress will be better.

The detailed directions for carrying out taxis will be found in all the works on general surgery, and would be out of place here.

External Tumors, Displaced Organs, etc.—*Cancers and sarcomas*, as well as the benign tumors which are rare in these parts, may obstruct the bowel, whether they are attached to the inside or outside of the intestinal wall, or to adjacent viscera but near enough to encroach upon the lumen by pressure. Tumors within the bowel are considered under Obturator Obstruction. The obstruction produced by tumors regardless of their situation develops comparatively slowly, and by the time it is serious, the tumor can generally be felt on palpation. Cancer is the commonest tumor of the intestines, and it most frequently causes obstruction by a gradual infiltration of the bowel wall in an annular form; but such carcinomatous strictures are discussed under Chronic Intestinal Obstruction.

Displaced organs may occasionally produce obstruction similar in character to that caused by tumors pressing from without, or gall stones lodged in the common duct may do the same by their pressure upon the intestine. The organs chiefly at fault in this respect are the uterus and kidneys. Retrodisplacements of the uterus which are frequently associated with enlargement may cause sufficient pressure upon the lower bowel to occasion a stubborn constipation, and exceptionally, such a condition may simulate obstruction. Associated with a displaced uterus, there is sometimes found an ovary which has prolapsed into the pouch of Douglas. Such

ovaries are usually abnormally tender, and sometimes give rise to almost absolute obstruction by reason of the pain which is caused by every effort to move the bowels.

Movable kidneys quite frequently interfere with the onward passage of the feces by a direct pressure upon a loop of intestine, but such pressure is likely to be intermittent rather than constant, so that constipation, rather than permanent obstruction, results as a rule.

A peculiar form of chronic constipation dependent upon conditions affecting the right kidney has been investigated by W. Arbuthnot Lane.¹ He says, "my attention was directed to this diminution of the lumen, particularly of the hepatic flexure, by the close resemblance of the symptoms in these cases to those of renal troubles, whether of calculus or of excessive mobility." Upon operating, nothing but bands of adhesions between the colon and kidneys, and a kink at the hepatic flexure of the colon, were found. However, when these were separated the cases were greatly improved. The patients who did not improve were women in poor physical condition, whose intestines were flaccid and plastic. In Lane's opinion the cause of these adhesions is an overloaded and distended cecum and colon which sets up enough irritation to produce the bands which bind together the colon and kidney. This author advises an anastomosis between the ileum and sigmoid flexure, because adhesions may re-form, and because the cecum and colon may fail to regain tone in spite of massage, electricity, and other treatment.

Symptoms of Obstruction from External Tumors, Displaced Organs, etc.—In the cases of ileus coming under this class, the symptoms generally develop slowly, except when a heavy organ by its sudden displacement abruptly and completely shuts off the lumen of the intestine, compressing at the same time, possibly, its mesentery so that the local circulation, as well as the passage of feces and gases, is interrupted. In these latter accidents the symptoms may be acute. Malignant growths

¹ *The Lancet*, January 2, 1904.

usually cause their own localized pain, which may complicate the clinical picture.

Otherwise these will appear with a gradually increasing severity, as in the case of tumors encroaching upon the bowel, or intermittently, as occurs more frequently in the case of pressure from displaced viscera, such symptoms as pain from gaseous distention, excessive eructations, vomiting of ingesta, with finally, in the severer cases which are not relieved, the vomiting of fecal matter and other distressing features of a stubborn mechanical obstruction.

The treatment of the forms of ileus just described must be in the main surgical, though position and certain mechanical measures may do much for the relief of obstruction due to pressure from displaced organs. A rest cure has often relieved, and doubtless sometimes permanently cured, such cases by the prolonged change from the vertical to a horizontal position of the trunk; and other changes of position may suggest themselves to you as likely to relieve individual cases of pressure from such a cause.

In Lecture XL. you will find descriptions of a method by which movable kidneys and other displaced abdominal organs can usually be raised up and held in place with the help of straps of adhesive plaster.

Obturator Obstruction. Gall Stones, Enteroliths, etc.—Obstruction caused by enteroliths, gall stones, and other foreign bodies impacted in the bowel is rarely complete in the beginning, and the circulation is less injured.

Enteroliths are ordinarily larger than gall stones. The nucleus of them is usually a gall stone around which the concretion is built up in successive layers.

Gall stones too large to pass through the gall duct sometimes ulcerate through into the intestine. They may cause intestinal obstruction in several ways. (1) Their presence in the gall bladder may set up inflammatory processes with the production of bands and adhesions which press upon and obstruct the intestine. (2) They may diminish the lumen of

the bowel by direct pressure on the duodenum, when large stones become lodged in the common duct. (3) They may form a mechanical obturator after they have escaped from the common duct into the lumen of the bowel.

The Murphy button has sometimes caused obstruction in the same way, and so have frequently various foreign bodies, such as *buttons, coins, false teeth*, etc., which have been swallowed.

Obstruction by worms, hardened feces, etc., belong under the head of obturation. Masses of dead worms killed by a vermifuge may produce serious obstruction, especially when there has been a previous stricture of the gut at any point. It is rare, except under similar circumstances, that fecal tumors cause such complete obstruction as to be followed by alarming symptoms, though they may often temporarily interfere with bowel movements before they can be softened by repeated doses of physic or by irrigation of the colon. They are especially likely to do this in cases of spastic constipation. (See Lecture LXIX.)

Polypi, and exceptionally sarcomas in the intestine, may also cause obstruction by plugging the lumen; besides, they often aid in the production of intussusception.

The symptoms of obturation ileus are in general much milder than those of the other forms of mechanical obstruction—at least in the beginning. Even when the occlusion is complete, there is very much less interference with the circulation in the walls of the gut, and none at all, as a rule, with that of the mesentery. There is also comparatively little shock, and in consequence the initial reflex vomiting, which is such a distressing feature in the forms of ileus due to the various forms of strangulation, may be absent altogether, or if present, is less severe. The initial pain may also be slight. When the bowel is completely plugged, the accumulation of its contents, together with the gases from fermentation, soon produces distention with consequent pain, which is likely to be paroxysmal or constant with frequent exacerbations, and vomiting, which finally in unrelieved cases becomes feculent.

The Pathology of Intestinal Obstruction.—Whatever the cause of the obstruction, the important pathologic changes in the intestine will comprise a great distention and dilatation of the tube above and its collapse below, while the affected segment will show first a stasis of the circulation, followed shortly by an intense degree of inflammation with often ulceration, which may perforate, thus leading to a secondary peritonitis. In the beginning the peristaltic movements are markedly exaggerated in the intestine above the obstruction, but the overaction is soon succeeded by exhaustion and paralysis. The dilatation, when the occluded segment is in the ileum or higher, will usually affect all of the afferent intestine and the stomach as well. When it is in the colon the dilatation will at first be limited by the ileocecal valve, but will eventually pass beyond this and involve the small intestines.

Differential Diagnosis of Acute Ileus.—It is generally comparatively easy to decide that your patient is suffering from acute obstruction. The clinical picture already described is too striking to admit of any mistake, and a leucocytosis of 18,000 or over by the end of twenty-four hours will confirm the diagnosis. It is exceedingly difficult, however, in many cases to determine which of the various causes has produced the trouble, and in just what part of the bowel it is situated. To arrive at such a pathologic and anatomic diagnosis would not be important if there were any hopeful medical treatment appropriate to all the different varieties, or if it were the approved practice to operate at once in every case, regardless of the cause. But neither of these propositions is true.

Suppose you have been called to a case of acute obstruction within the first few hours and find the usual symptoms of pain, vomiting, obstipation, and beginning tympanites. You will at once examine most carefully and note whether there be anywhere a special loop of intestine or region of the abdomen which is particularly inflated. Such a finding would point, first of all, to volvulus, especially if it were in the situation of the sigmoid, but might mean intussusception or strangula-

tion from any cause, particularly if the onset had been very sudden. If an invagination had occurred, you would usually be able to feel a sausage-shaped tumor just below the distended loop. If no such tumor were palpable, and no external hernia were discoverable, you would think of strangulation by a band or diverticulum. If the onset had been sudden and severe, including early vomiting as well as pain, and within the first five to ten hours the abdomen were already becoming exquisitely tender, showing peritonitis to be developing, you would have reason for strongly suspecting the perforation of an ulcer into the peritoneal cavity, and that a dynamic obstruction had resulted.

If tenderness were present over all or part of the abdomen, and this and pain had for some time preceded the vomiting, you would think of a peritonitis produced by some infection, such as an extension from a diseased appendix or fallopian tube, or the gradual leakage of pus from an abscess. In acute peritonitis an abnormally high temperature, in the rectum at least, is only very exceptionally absent, though it may be in some very grave cases in which there is great exhaustion.

If the patient should be a child under ten, or even twenty years, intussusception would be the most probable cause of a suddenly developed ileus, and next after this, in likelihood, would be hernia or obstruction by worms. Twists, kinkings, displacements, and strangulation under attached diverticula or peritoneal bands are comparatively rare in childhood.

In older patients, the more sudden and violent the onset of ileus the greater the probability that the cause is hernia, or else volvulus or some other form of strangulation not remediable except by surgery. It could, however, be due to an intussusception in the colon which might possibly be reduced by inversion and inflation from below. If so, there would likely be tenesmus, and you would probably find blood-tinged mucus in the evacuations. If no tumor could be felt and no external hernia be found, you should infer that the cause was probably one of those conditions requiring surgical intervention.

Indeed, in so far as regards the more threatening cases which have had a sudden and violent onset, excluding those dependent upon perforation already referred to as well as incarcerated or strangulated external hernias, which can generally be recognized and sometimes relieved by taxis, etc., the only probable condition in which, as a rule, anything of practical advantage can be gained by determining the locality of the lesion in the bowel is intussusception. When the usual sausage-shaped tumor characteristic of such a lesion can be felt, you can usually decide readily whether it is in the colon, affording then some encouragement for a trial of non-surgical measures, or in the small intestines, in which case, if the inverted position should fail to accomplish anything, there would be virtually no remedy left except laparotomy. Together with a palpable tumor, frequent evacuations containing only a little blood and mucus and passed usually with much straining, would be diagnostic of intussusception when present with the symptoms of acute obstruction; and as to localizing the invagination, besides the situation of the tumor, the amount of warm water which could be injected and retained for even a few minutes in the colon would indicate approximately how far up in it the obstruction was.

In the obturator forms of ileus it is important to make the ætiologic, pathologic, and anatomic diagnosis, and as soon as possible. Many such cases can be remedied without an abdominal section, and the results of operative intervention are very much better when done very early. Obstruction due to plugging by gall stones, enteroliths, foreign bodies, hard fecal masses, etc., is seldom complete at first, and for this reason as well as because of the fact that no violence has been done to the mesentery, and the interference with the local circulation of the part in the beginning is but slight, there is a mildness of the early symptoms in marked contrast to those of the forms dependent upon strangulation. The pain is usually much less intense, and is not accompanied by vomiting at first. Some gas, and often even a part of the feces, may pass the obstruc-

tion, and in consequence marked distention is much later in developing.

When a gall stone is the obturator, whether or not it has been enlarged by successive accretions into an enterolith, the patient will generally have had previous attacks of hepatic colic accompanied, as a rule, by jaundice, bile-stained urine, fever, etc. There will also be often a persisting tenderness in the region of the gall bladder.

In the case of foreign bodies, there will generally be a history showing that something of the kind has been swallowed, and if they are metallic the x-rays will reveal their situation. When a fecal mass is the offender, there will be a history usually of a long-standing constipation and symptoms similar to, but still milder, as a rule, than those that may follow obturation by gall stones, foreign bodies, etc.

The symptom vomiting in obturation ileus calls for special consideration. It is here generally a late manifestation, but when it appears, more speedily becomes fecal than in the other forms. The reason for this is that, in the more violent forms due to strangulation and characterized by initial emesis, the contents of the stomach and bowel above the obstruction are so completely emptied before the time when fecal vomiting would usually set in, that no feces have been made and there remains little out of which they can be made. Moreover, in the severer forms, death often occurs before there has been time for the development of stercoraceous vomiting.

The pain in the obturation ileus is not only less violent, but also much less continuous. In fact it is usually rather intermittent, resembling somewhat labor pains, being intensified at every contraction of the afferent part of the intestine. There is rarely any such profound shock with collapse as generally accompanies strangulation ileus.

The following table, contributed by R. Fitz to the Transactions of the Congress of Physicians and Surgeons, vol. i., 1888, shows the percentage of each of the more prominent

symptoms which occurred in the several varieties of ileus in a series of 295 cases of acute intestinal obstruction :

	Strangu- lation Per cent.	Intussus- ception Per cent.	Twist Per cent.	Gall Stones Per cent.	Stricture or Tumor Per cent.
Pain	82	70	60	83	60
Nausea and vomiting	69	75	37	74	80
Fecal vomiting	47	13	15	61	33
Tympanites	56	33	55	56	66
Tumor	10	69	..	13	27
Visible coils	11	..	7	..	20

Ewald makes much account of the information obtainable by an inflation of the colon with air or any inert gas or the injection of water.

Digital examinations per rectum and vaginam, as well as the most painstaking palpation of the abdomen, will help to locate obstructing tumors or displaced organs, fecal masses, twists, intussusceptions, etc.

Finally the finding of marked indicanuria will point to the small intestines as the probable seat of the obstruction, though there is likely to be a moderate excess of indican present in the urine, even when the trouble is in the cecum or colon.

The Prognosis of Acute Ileus.—Complete occlusion of the intestines is a very serious affection, and a very large proportion of all the cases prove fatal. The milder cases of dynamic ileus, some of which scarcely amount to acute obstruction, may be temporary in character, and do not warrant so bad a prognosis, and the cases due to a local peritonitis are very generally rather amenable to treatment, either medical or surgical. Even the severer cases, like the external hernias and the invaginations in which the diagnosis can usually be made early, can often be rescued by prompt surgical intervention, but too often, unfortunately, either the attending physician or the family insist upon waiting until it is too late. In the internal hernias, twists, and other obscure strangulations, the danger is greatly increased by the obscurity and difficulty in making a certain

DIFFERENTIAL DIAGNOSIS BETWEEN VARIOUS FORMS OF INTESTINAL OBSTRUCTION¹

STRANGULATION	INTUSSUSCEPTION	TWISTS (VOLVULUS)	CHRONIC INTESTINAL OBSTRUCTION	APPENDICITIS	PERITONITIS
<i>Subjective Symptoms</i>	<i>Subjective Symptoms</i>	<i>Subjective Symptoms</i>	<i>Subjective Symptoms</i>	<i>Subjective Symptoms</i>	<i>Subjective Symptoms</i>
1. Generally occurs after age of 20.	1. Most frequent during childhood.	1. Most frequent after age of 30.	1. Middle life.	1. Most cases occur before age of 25.	1. Usually in middle life.
2. Pain localized, causing rapid collapse.	2. Constant tenes- mus.	2. Pain diffuse.	2. Pain diffuse, but comes on gradually.	2. Pain often de- velops rapidly.	2. Pain develops suddenly.
3. Pain intense, par- oxysmal charac- ter.	3. Pain develops suddenly and is continuous.	3. Pain paroxys- mal, but recurs at longer inter- vals than in strangulation.	3. Pain contin- uous.	3. Pain contin- uous.	3. Pain contin- uous.
4. Constipation com- plete.	4. Frequent diar- rheas and pas- sage of bloody mucus.	4. Constipation complete.	4. Constipation complete.	4. Stools infre- quent.	4. Stools infre- quent.
<i>Objective Symptoms</i>	<i>Objective Symptoms</i>	<i>Objective Symptoms</i>	<i>Objective Symptoms</i>	<i>Objective Symptoms</i>	<i>Objective Symptoms</i>
1. Temperature often subnor- mal.	1. Temperature nor- mal or subnor- mal.	1. Temperature slightly ele- vated.	1. Temperature moderate; fre- quently high.	1. Temperature moderate; fre- quently high— 101° F.	1. Same as in appendicitis.
2. Pulse very weak.	2. Same as in stran- gulation.	2. Same as in strangulation.	2. Pulse of good volume.	2. Pulse of good volume.	2. Pulse usually of high ten- sion.
3. Stercoraceous vomiting comes on early.	3. Same as in stran- gulation.	3. Same as in strangulation.	3. Stercoraceous vomiting comes on after first few days.	3. Same as in intestinal ob- struction.	3. Vomitus greenish, rare- ly stercora- ceous.
4. Location in small intestine.	4. Location in small intestines; bow- el frequently protrudes at rectum.	4. Location in small intes- tine; abdomen often pro- trudes in cer- tain areas, giv- ing dullness on percussion.	4. Location in large intes- tine; dullness on percussion.	4. Location in right iliac re- gion; dullness on percussion.	4. Diffuse inflam- mation; tym- panitic reso- nance.

¹ From Gould and Pyle's "Cyclopedia of Medicine and Surgery," Blakiston's Son & Co., Philadelphia, 1900.

diagnosis at the only time—in the early stages—when immediate laparotomy affords the only hope of cure.

Obturation ileus has generally a much better prognosis than any other of the mechanical forms. The onset and symptoms until complete occlusion occurs being milder and the course much more gradual, there is a better opportunity for bringing to bear effective treatment at an early stage.

The Treatment of Acute Intestinal Obstruction.—In previous sections of this lecture I have told you of such methods of medical treatment as give some promise of favorable results in certain varieties of acute obstruction, with occasionally a reference to the surgical operations which have yielded the best results. It is not intended in this work to instruct you in the technique of any such operations. Those of you who do your own abdominal surgery will naturally refer to treatises upon that subject, and the others should call in a competent laparotomist early in every case of acute ileus.

It remains to be said concerning the medical treatment of acute obstruction that the patient should be put to bed, and as perfect rest as possible secured for the whole body, and for the functions of the alimentary canal in particular. Allow no food, drink, or medicines to be taken into the stomach; but small bits of ice may be dissolved in the mouth as often as desired, provided the water be not swallowed. The mouth and tongue may be moistened as often as necessary by a pledget of cotton or sponge wet in ice water. When the obstruction is in the small intestines, half-pint enemas of warm (or tepid) water may be, from time to time, allowed to flow into the bowel from a fountain syringe, placed not more than a foot or two above the patient. When such enemas cannot be retained, fluid must be supplied to the system by injecting a weak saline solution, either subcutaneously or into a vein.

In prolonged cases, provided the obstruction be not in the colon, small nutritive enemas may be given several times a day.

As to the use of *drugs*: in the first place, purgatives must

not be administered either by mouth or rectum, unless other forms of obstruction than those from fecal concretions or masses can be pretty certainly excluded. They may produce a fatal aggravation. They are useful in fecal obstruction—dangerous in nearly all other cases.

Narcotic medicines are indispensable when the pain is very severe, and are useful also to quiet excessive and harmful peristalsis. Opium, or some one of its active principles, will need to be administered, either by suppository or hypodermically in most cases. After an initial dose of morphine hypodermically, extract of opium, with extract of belladonna by the rectum, is usually sufficient. Atropine will often prove a most valuable adjunct to the opium, and has a still more powerful influence in the relaxation of spasm. With every 1-4 grain of morphine injected there should be, in these cases, at least 1-60 grain of atropine, and some bold therapists claim to have obtained brilliant results without harmful effects from such extreme doses as 1-12 grain. When suppositories are administered, you may combine, with advantage, 1-2 grain of extract of belladonna with every grain of extract of opium. No doubtful case of acute obstruction should be given up as hopeless until the effects of full doses of belladonna or atropine have been noted.

Washing out the stomach with a warm saline solution is a safe procedure in nearly all cases of ileus, and will, at least, lessen the vomiting by removing the contents of the viscus all at once. Sometimes it is reported to have effected almost magical cures; but my own experience with it in such cases has been exactly like that of Ewald. I have seen it improve all the symptoms for a time, but never effect by itself a cure.

The administration of *metallic mercury* is no longer to be recommended. It very seldom effects any good results, and in certain cases could easily do great harm by increasing an invagination, twist, or strangulation. In the cases of fecal obstruction in which only it could be of service, we have better remedies in atropine and castor oil, or the saline laxatives.

In by far the largest number of all cases of acute obstruction, laparotomy is the only hopeful remedy, and little time should be wasted in other measures in very severe or threatening cases.

CHRONIC INTESTINAL OBSTRUCTION—STENOSES

Most of the causes of ileus above described may at times produce incomplete occlusion only, and then the clinical picture is likely to be rather that of chronic than of acute obstruction.

Chronic Intussusception.—Invaginations do not always close the lumen of the gut completely and then assume a chronic form with occasional acute exacerbations. Such a condition is rather misleading, and has been often overlooked. In such cases the bowels may move regularly, with or without the help of aperients, and are often loose. There is much pain which is usually paroxysmal, occurring once or oftener daily, though sometimes only at much longer intervals. Vomiting is rare, but the typical evacuations of blood-tinged mucus will be passed at times, especially during the acute exacerbations, and during the latter, too, there may be tenesmus. The intussusception is oftenest found in the lowest part of the ileum (ileocolic), but any part of the large or small intestine may be involved. The usual sausage-shaped tumor can be felt in over half the cases.

Strictures from Healed Ulcers and Carcinoma.—A majority of cases of intestinal stenosis are probably produced by the cicatrices of the various kinds of ulcers. These are discussed with sufficient fullness in Lectures LV. and LVIII. Carcinoma produces stenoses in various ways, but chiefly by an annular infiltration of the gut which gradually thickens the wall by an infiltration of all the layers, and thus lessens the lumen. Tumor masses may also project within the bowel and lead to the same result.

The symptoms of carcinomatous stenoses include the pain characteristic of malignant growths, which in most cases is

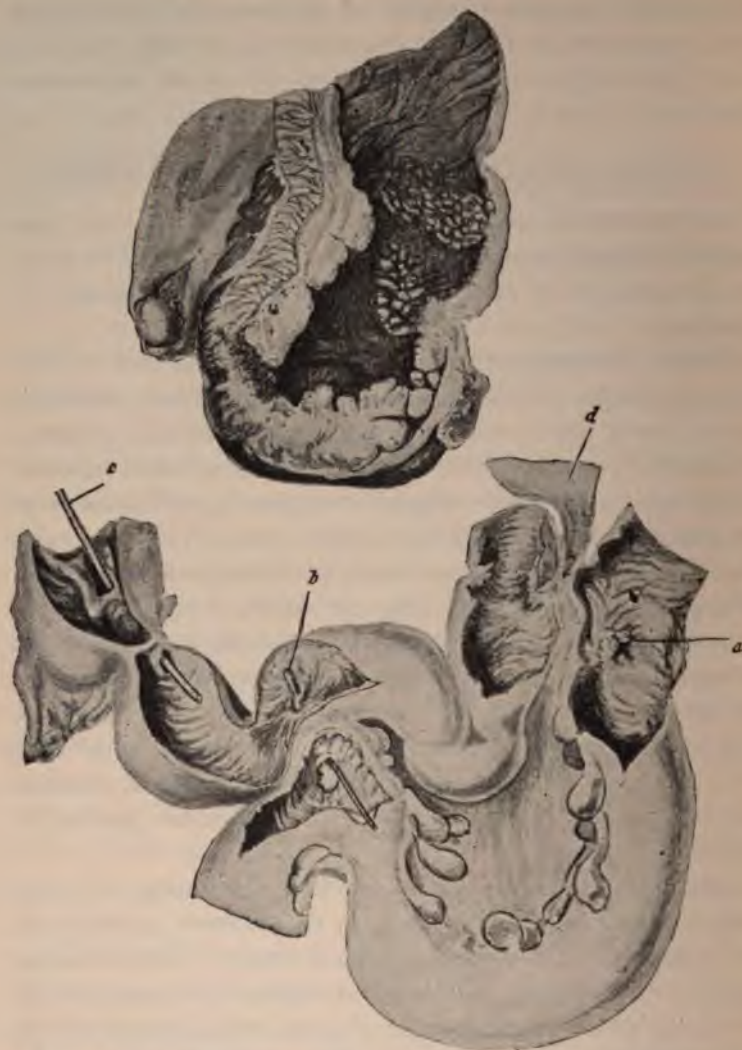


FIG. 94.—Tuberculous stricture of the ileum. Upper figure shows hypertrophy and atrophy of intestine above and below stricture. Lower figure shows parts removed from section in same case; *a*, ulcer at site of rent in colon made during operation; *b*, fistula bimucosa between ileum and sigmoid flexure; *c*, ileocecal valve; *d*, mesenteric band. (From a paper on Enterostomy for Tuberculous Stricture of the Intestine, by F. M. Caird, F. R. C. S., in *Scot. Med. and Surg. Jour.*, vol. xiv., No. 1.)

rather persistent, though rarely very severe, and may be absent. In addition there are, as a rule, the other symptoms of



FIG. 95.—Colloid cancer and tubercle. Figure to right, posterior view of cecum, etc., *a*, ileocecal valve; *b*, appendix. Upper left figure from same case, portion of small intestine with patch of colloid cancer. Lower left figure, the same in section. (From a paper on Enterostomy for Tuberculous Stricture of the Intestine, by F. M. Caird, F. R. C. S., in *Scot. Med. and Surg. Jour.*, vol. xiv., No. 1.)

such a growth—anæmia and generally in time a cachexia, debility, emaciation, and disturbances of the digestion. As a



FIG. 96.—Tuberculous stricture of the ileum. Upper left figure shows great dilatation above stricture and tuberculous deposits tending to form strictures. Lower left figure from same case. Remote lower stricture. Figure to right from another case, marked dilatation of part above stricture. (From a paper on Enterostomy for Tuberculous Stricture of the Intestines, by F. M. Caird, F. R. C. S., in *Scot. Med. and Surg. Jour.*, vol. xiv., No. 2.)

result of both the decreasing motility of the intestinal muscle above the affected part, and of the slowly narrowing stricture, constipation and meteorism gradually develop. Finally, especially when the stricture is in the lower part of the canal, some time before the tumor has shut off entirely the lumen of the bowel, feces accumulate in the dilated loop above and set up the symptoms of acute obstruction. Such acute attacks may be overcome and recur repeatedly before the lethal end comes, except when there has been surgical intervention.

Tubercular Ulcers and Growths as Causes of Chronic Obstruction.—Tuberculosis may obstruct the intestines both by the contraction of the scars of healed tubercular ulcers, and by the formation of tumor-like masses within and around them, through a process of infiltration, or fibrous hyperplasia. Annular constrictions similar to those of cancer also occur.

The cecum and lower ileum are most frequently involved. In six out of eleven cases reported by Caird¹ the ileocecal valve and cecum were affected, and the appendix was completely hidden in the mass of proliferated tissue. In four of the same series of cases, the small intestine only was implicated. (See illustrations on pages 702-704.)

In Caird's cases the symptoms had been little marked at first, as in nearly all instances of intestinal stenosis from a cause which only gradually develops, though generally he has been able to obtain a personal and family history of tubercle. There is usually a history of failing health for years, with indigestion, colicky pain, tenderness on pressure, and constipation. Vomiting is frequent and generally relieves the pain, but no blood is brought up. Caird particularly calls attention to the presence in nearly all the cases of loud borborygmi. He has been able to palpate a tumor in the ileocecal cases, and reports that he has not often noted complete obstruction, except when the stricture has been blocked by some foreign body.

As in other strictures of the intestine, serious symptoms of

¹ *Scot. Med. and Surg. Jour.*, vol. xiv., No. 2.

increasing meteorism, pain, emaciation, exhaustion, etc., develop finally, even before the stricture has caused complete occlusion.

As to *treatment*, surgery affords the only effective resource, and Caird reports that out of his eleven cases, seven were cured by enterectomy.

LECTURE LXV

ACUTE CATARRH OF THE INTESTINES (ENTERITIS ACUTA)

THIS is deemed by some authors the most frequent disease of the bowels; but the chronic form of intestinal catarrh, involving the small intestine and having constipation as its main symptom, is probably still more prevalent, though very often overlooked.

Acute enteric catarrh may affect the entire gut at once, or be limited to any part of it. When its chief seat is the upper part of the small intestine (especially the duodenum), catarrh of the stomach almost always coexists, and *vice versa*. The colon alone, or any part of it, may be affected, especially the cecum or the rectum, without the involvement of the small intestine, but, according to Nothnagel, it is very unusual for the ileum to be the seat of a catarrhal process without the colon's being also to some extent implicated.

Ætiology.—A most important light has been shed upon intestinal diseases through the recent exact studies of the digestive system. It has been shown that the secretion of HCl in the stomach is very frequently excessive, and it is probable that when this continues in high degree for a long time, the mucous membrane of the upper intestine, that of the duodenum especially, may become irritated and finally involved in a catarrhal process. It has been noted, too, by many observers, that long-standing cases of hyperchlorhydria are often associated with constipation, which seems to be a result, being often relieved when the HCl excess has been overcome. And constipation is a frequent cause of enteric catarrh in both its acute and chronic form. It has been observed also, by Allen

Jones and others, that a very low or absent gastric secretion is often apparently a direct cause of diarrhea. In stubborn intestinal catarrhs, therefore, it is very important to know the state of the gastric secretion, and to correct it when abnormal. Acute enteritis is sometimes caused by corrosive poisons, especially overdoses, or the too frequent repetition of purgatives. In persons predisposed to such attacks, cold may be the cause; especially prolonged exposure to wet and cold. Drinking freely of ice water sometimes excites an attack, but by far the most common causes of the affection are infection from spoiled or decomposed food and the irritation from indigestible, or at least undigested, aliments. This may result from an improper kind of food, as well as from too hot or too cold ingesta, or an excess of proper food; also from eating when, on account of either great fatigue, overheating, or powerful emotions, the usual digestive processes are interfered with. Burns over the abdomen may also set up a catarrh, or even acute ulceration in the intestines. Malarial infection, tuberculosis, typhoid fever, and other diseases may be accompanied by a secondary acute enteritis.

Pathology.—Acute enteritis may pathologically assume at least three different forms—mucous, mucopurulent or purulent, and pseudomembranous. There are redness, either diffused or in patches, swelling of the mucosa,—in severer cases, of the submucosa also,—and increased secretion which is usually mucoid, but when the inflammation is very high, may become purulent. The membrane is covered with slimy mucus, and the blood-vessels are injected—dilated.

The solitary follicles in certain of the cases are swollen and prominent, projecting above the level of the mucosa. In other cases patches of the mucosa become loosened and desquamate.

In the intenser types there is a large emigration of leucocytes, and the surface of the mucosa may be covered with pus. Extravasations of blood may also occur in places. A round-cell infiltration takes place in the mucosa and submucosa.

Follicular ulceration often develops from the swelling and bursting of the solitary follicles.

In the pseudomembranous type, the mucus exuded is of a tougher and more plastic nature, so that patches, strings, or large masses form—sometimes true casts of portions of the intestine. The latter cases are usually characterized by constipation instead of diarrhea, as in the ordinary acute catarrhal cases. Membranous enteritis does not often occur in an acute form, but is generally a subacute or chronic process. See Lecture LXXIII. on Membranous Catarrh of the Intestines.

Symptomatology.—Diarrhea is the predominant symptom of acute intestinal catarrh, and probably occurs in all cases, with the exception of those in which the process affects the stomach and duodenum only. It usually comes on suddenly, the stools to the number of three to six, or even exceptionally ten to twenty in the twenty-four hours, being at first semi-solid, then mushy, and later gruel-like, dark, offensive, and mixed with firmer masses or scybala, but still later almost odorless, of a pale yellow or grayish color, and containing considerable quantities of mucus. In young infants the stools are often green. Pains in the bowels, often severe and colicky, generally precede the attack, and often recur with each stool. Tenesmus points to involvement of the rectum. In typical cases there are gaseous rumblings, a vague sense of general discomfort, and very frequently nausea at first, which may go on to vomiting, especially when the attack has been due to imprudence in diet with an overloading of the stomach; also when the appendix is involved in the acute catarrhal process.

Early in an attack, or even after several days in cases wrongly treated by astringents and opiates before a thorough emptying of the bowel, percussion may reveal accumulations of feces in the cecum, flexures of the colon, the prolapsed center of the transverse colon, or in the sigmoid flexure, and nearby or above such obstructing accumulations, areas of tympany may be found.

Sudden tapping with the finger tips in the same region often

causes high-pitched splashing sounds due to the presence of liquid feces and gases. Digital exploration may discover hard fecal masses in the rectum, especially in cases where neglected constipation has been a cause of the enteritis. Deep palpation frequently produces pain over the course of the colon, when this part of the bowel is much involved. This sign, together with a larger amount of free mucus with the stools, will help you to differentiate a colitis from inflammation of the small intestine only. Boas is authority for the statement that, in colitis, bilirubin cannot be recognized in the stools, having been converted into urobilin.

When the stools contain much undigested matter with comparatively little mucus, and this finely divided as well as intimately mixed with the feces, the catarrh affects the small intestine mainly. In the same condition the microscope will reveal many undigested muscle fibers, fat globules, and starch granules.

The chemical reaction of the feces in enteritis varies widely. At present it affords no certain trustworthy guide, except that when there is excessive acidity alkaline astringents, such as the preparations of lime, should be included among the remedies prescribed.

Some rise of temperature is a usual accompaniment in marked cases, especially those due to infection. Fever is nearly always present when the patient is an infant or young child, but is less constantly seen in older patients. Various degrees of exhaustion and nervous derangement may result, the form and severity of such phenomena depending upon the age, temperament, and previous strength of the patient. The urine becomes scanty, high-colored, and often loaded with indican. Albumin and even hyalin and blood casts may also appear in the urine during the attack, disappearing after convalescence.

Diagnosis.—Primary acute enteritis does not closely resemble any other affection. Cholera morbus and cholera infantum, which may be considered as merely violent forms of acute gastro-enteritis, produced by an uncommonly severe in-

fection, are easily differentiated by the early and severe gastric symptoms, their more rapid and violent course, including the early serious prostration, and wasting and pronounced and very painful cramps. It would not be possible to diagnosticate from simple acute enteritis the precursory diarrhea of Asiatic cholera, but later the rice-water stools containing the comma bacillus would be decisive.

Serous diarrhea from nervous causes is recognizable by the character of the stools and the absence of all inflammatory symptoms, including mucus in the stools and tender spots over the abdomen.

Prognosis.—Uncomplicated acute intestinal catarrh is rarely fatal, except in infants under three years, and even in the latter is nearly always curable, provided the child can be kept under the best possible hygienic conditions, removed to the seashore or mountains, when the attack occurs in hot weather, and have a suitable diet, including good breast milk for those not yet weaned, or fresh cow's or goat's milk, properly modified and combined, for the older ones.

In very old or debilitated persons, too, the affection is sometimes fatal, but generally because of incurable disease in the stomach, heart, liver, lungs, or kidneys, of which it is merely a complication.

Treatment.—In no acute disease is the proper treatment simpler or more uniformly successful than in acute enteritis in adults or in children over three or four years old; and yet probably none is oftener wrongly treated. The indications are first to remove promptly and thoroughly the noxious cause, instead of waiting for nature's slow efforts to accomplish this by diarrhea, and next to give as complete rest as possible to the temporarily crippled digestive system. When you have secured these two conditions, nature will quickly effect a cure in the great majority of cases without other aid. Elimination and functional rest then constitute the keynote of the treatment; and in febrile cases, rest in bed should be enforced. The emptying of the alimentary canal can generally

best be accomplished by some gentle laxative, though if the symptoms are urgent, as when there is high fever or convulsions, or other serious nervous complications, pointing to grave auto-intoxication, you should also cleanse the colon at once by a copious irrigation with a warm saline solution to which some antiseptic may be added. For the laxative, a saline or castor oil in not too large a dose (say one to four teaspoonfuls of the latter) usually proves efficient, but no single remedy acts so magically as a mild mercurial purge, preferably calomel in the dose of 1-20 to 1-6 of a grain, according to the age, mixed with a grain of sugar of milk and repeated every half hour, until a favorable change of color appears in the stools. Not more than six to ten doses should be needed to restore the normal dark yellow color, or at least a rich golden yellow showing an increased content of bile, and at the same time to remove in a few hours all the worst symptoms. I will not attempt here to answer the objections which have been urged against this remedy, nor to speculate as to how small doses of calomel accomplish such strikingly good results. It is sufficient to emphasize the often observed clinical fact that the remedy will cure rapidly, pleasantly, and harmlessly in most of these cases, provided at the same time the digestive system is allowed to rest, the food being either wholly stopped for a day or two, or (when this is impracticable) limited to the lightest possible articles, such as a few spoonfuls at a time of toast water, egg water, or rice water in babies, and very small feedings in adults of wine whey or the weakest broths. If by the second day, with such a treatment, the patient is not well, or so nearly so that manifestly nothing further is needed beyond a day or two more of functional rest through a severely restricted diet, you may administer one-half the former dose of calomel every two or three hours for one day longer. If there should then be still a tendency toward diarrhea, it would indicate either an exceptionally severe infection, or that there had been previously a chronic catarrh, involving portions of the intestines, and often the stomach as well. This chronic

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process after the subsidence of the acute attack would prevent an early return to normal conditions and demand further treatment. Some one of the bismuth preparations, given in a simple mixture of mint water and limewater after every stool, should then prove efficient in controlling the remains of the diarrhea. The following formula usually does well:

℞ Bismuth subnitrat. 3 iii
 Tannalbin. 3 v
 Mist. cretæ, q. s. ad. f 3 iv
 M. Sig.: One-half to two teaspoonfuls, according to age, after every loose stool.

When much pain or frequent loose movements persist, as will very rarely happen if the above-mentioned plan is carried out in its entirety, the foregoing prescription may prove more rapidly effective with a few drops of paregoric or deodorized tincture of opium added to each dose.

Another good formula for stubborn cases is the following:

℞ Ichthalbin }
 Tannalbin } aa 3 ii
 M. et ft. chart No. XV.
 Sig.: One to two powders in milk or water upon arising, at bedtime, and after each loose stool.

Remember especially that during the first day or two the important thing is to assist nature in clearing out the alimentary canal, and to spare the digestive organs by allowing the smallest possible amount of nutriment. To give an astringent before the bowels have been thoroughly emptied is never useful or justifiable, but always harmful and sometimes disastrous. The early use of opiates should be equally avoided, except in the presence of intolerable pain, and even then a further gentle use of laxatives in addition to antacids, combined if need be with an antispasmodic, such as the annexed prescription calls for, is generally all-sufficient and far safer:

℞ Tr. Cardam. comp. f 3 iv
 Sps. ammon. arom. f 3 iii
 Sps. chloroform, q. s. ad. f 3 xii
 M. Sig.: Teaspoonful in half-glass of hot water every hour or two till relief.

When the colon is solely or chiefly involved, cleansing from below by irrigations with saline, soothing, and antiseptic solutions sometimes offers advantages, especially in proctitis, though in chronic colitis these local measures play a more important rôle than in the acute form. In simple acute, non-dysenteric colitis, rest of the whole body by confinement to bed and rest, especially of the digestive organs, with elimination by laxatives, will usually cure within a few days.

The diet for the exceptional cases that linger on longer, in spite of the treatment above laid down, should comprise, mainly, thoroughly fresh milk boiled and mixed with lime-water or peptonized and, in the case of children, properly diluted and modified to approximate it to human milk, fresh beef juice pressed out of a broiled steak, soft-boiled or poached eggs, or egg water for children, Eskay's Food, or Plasmon, Bovinine, whey, kumyss, and later chopped beef, toasted bread, zwieback, boiled rice, and the best of the various biscuits (crackers) on the market, provided they are fresh. The biscuits sold in the shops are often many months old. All the vegetables and fruits should be avoided. Should the gastric juice be found deficient, HCl and pepsin may be given, especially when the diet is increased. In the cases in which there is an absence of gastric secretion, with atrophy of the glands, the preparations of pancreas may be administered hopefully with or after food. When the HCl secretion is excessive, on the other hand, the preparations of chalk and bismuth should be administered with nitrate of silver and, if need be, belladonna, but, as a rule, not opium, which tends usually to increase the secretion.

Let me repeat in closing, (1) that in the early stages of any acute inflammatory or infectious diarrhea, astringents are always, and opiates generally, useless and harmful; and (2) that with the proper treatment by rest and elimination in the first stage, there will rarely ever be any second stage to treat.

LECTURE LXVI

CHRONIC CATARRH OF THE INTESTINES (ENTERITIS CHRONICA)

PROBABLY no disease affecting the digestive system, except the derangements of gastric secretion, is more prevalent than the chronic form of intestinal catarrh. It is very often overlooked, the victims being treated for the associated neurasthenia, which in some cases may be the cause, and in many others is certainly a consequence. The only symptoms of certain mild cases are often nervous derangements, and in the earlier stages of the less severe cases there may be absolutely no symptoms, except usually some sluggishness of the bowels.

Ætiology.—Some of the causes which provoke acute catarrh of the intestines also tend to produce the chronic form. These include improper diet, and especially overeating, insufficient exercise of the abdominal muscles, enteroptosis, constipation, the abuse of purgatives, and a prolonged excessive secretion of the gastric juice (hyperchlorhydria) among other ætiologic factors. It is probable that in persons with an inherited tendency to it, lithemia, as well as neurasthenia due to excessive mental work or overstrain of the nervous system in any way, especially sexual excesses or irregularities, may stand in a causal relation to chronic enteric catarrh, as also to various other derangements and diseases of the digestive system. The most frequent sequence of events in these cases is, according to my experience, as follows:

(1) An inherited neurotic tendency; (2) overstrain or other injury to the nervous system with deficient exercise and excessive eating, often provoked by tonics; (3) a resulting derangement of the digestion either gastric or intestinal, or both, and most commonly some aberration of the gastric secretion,

especially hyperchlorhydria; (4) deranged defecation—constipation or diarrhea; (5) auto-intoxication from the absorption of the toxic products of a perverted metabolism; and (6) enteritis, which is often acute at first, recurring frequently enough to set up finally a chronic inflammatory process, though it may be in many instances chronic from the beginning. In all the persistent cases, of course, a vicious circle becomes established, and then the catarrhal process and auto-intoxication are each increased by the other. The disease may result secondarily from morbid growths in or adjacent to the intestines, and from certain affections of the heart, kidneys, stomach, liver, tuberculosis of the lungs or the bowels, as well as from organic disease in other parts of the body, including, of course, typhoid fever, and sometimes malaria. Influenza is perhaps the most frequent acute cause of the disease, and the recent large increase in the prevalence of appendicitis is possibly a direct result of repeated attacks of grippe involving the intestines. A slowing of the circulation, in consequence of cardiac or hepatic disease, is often also a predisposing cause of chronic enteritis.

Pathology.—In chronic intestinal catarrh there are present the usual changes in the mucous membrane which characterize the same process elsewhere. The mucosa becomes at first gradually swollen and thickened. Its color is grayish or pale reddish, with dark or black pigment in places. As in the acute form the blood-vessels are enlarged, distended, and often tortuous; the secretion is increased, and the surface of the mucosa is covered with a layer of viscid mucus.

Chronic enteritis may be hyperplastic, with increase of the glandular elements, a marked infiltration of round cells, and often proliferation of the connective tissue, or atrophic with, in the end, a shrinking of all the structures. In the latter type, which is a late development of the ordinary catarrhal enteritis, the glands themselves undergo atrophy, and both the mucosa and submucosa become thinner. Ulcers and erosions are frequently present in this form or stage of the inflamma-

tion. As in inflammation of the gastric mucosa, there is also a form of chronic enteritis in which proliferation of the connective tissue is the predominant feature, and then the glands secondarily atrophy as a result of the pressure of the surrounding hyperplastic structures.

Symptomatology.—Though there may be no marked symptoms at first, yet even in the lightest case the patient commonly shows some falling off in nerve tone, and in both mental and physical vigor, or is at least more easily tired than usual. There are likely to be felt also, quite early in any pronounced case, uncomfortable sensations, referred to some part of the lower abdomen. These come on two to four hours, or even longer, after a meal, and consist usually of a feeling of pressure, fullness, or distention from gases which often cause rumbling and gurgling sounds—borborygmi. These flatulent symptoms frequently constitute the only discomfort experienced, the bowel movements continuing for a time apparently normal, though generally there is either constipation or diarrhea, or first one and then the other. When such an alternation exists, the underlying condition is really one of constipation, the recurring attacks of diarrhea being due to the irritation provoked by retained masses of feces. When the catarrh involves the colon, the acme of symptoms generally occurs shortly before the stool. In cases of chronic colitis, in which there are only one or two stools daily, and these in the morning, the patient is likely to be awakened early by the accumulation of gases, with the resulting discomfort or pains.

In duodenal catarrh the stomach is nearly always more or less involved. Exceptionally then, and sometimes when the catarrh affects only other parts of the gut, there may be nausea, vomiting, and loss of appetite. Anorexia is indeed a very common symptom in all the severer forms. Pain or discomfort within an hour or two after taking food is often experienced in duodenal catarrh, and in these cases, also, even with no demonstrable implication of the stomach, there is likely to be much eructation of gas, coming on soon after be-

ginning to eat. The same phenomenon you may observe after a thorough lavage. This seemed to me difficult of explanation until I reflected that the opening of the pylorus for the downward passage of the liquid in the stomach would permit an upward rush of the gases which were distending the bowel.

Vertigo, headache, anorexia, and jaundice, or at least a very muddy color of the skin, are much more frequently encountered in catarrh of the duodenum than when this most important part of the digestive tube is not involved. When the rectum shares in the catarrhal process, the patient will usually complain much of tenesmus after the evacuations. There may be no really painful straining, but instead only a feeling that the stools are not complete—as though some feces remain which cannot be expelled.

In severe or advanced cases of catarrh in any part of the bowels, there is always much self-poisoning from the absorption of the products of faulty metabolism, and you may expect to find many of the typical symptoms of lithæmia and nerve exhaustion, including especially palpitation of the heart with cold extremities, more or less anæmia, insomnia, either mental depression or great irritability, impaired memory, physical debility, etc. In bad cases which do not respond to treatment, you will be likely to observe also a more or less progressive emaciation and loss of strength, as well as a gradual aggravation of all the symptoms, including especially a stubborn diarrhea in advanced cases which involve a large portion of the bowel.

Boas¹ calls attention to the great variability of different cases of chronic enteric catarrh, some running an almost latent course, while others are marked by very troublesome symptoms. He has found the general condition of the patients in cases characterized by constipation to be usually little altered, while in chronic enteritis accompanied by copious diarrhea, especially if it involve predominantly the upper bowel, the condition of the patient is much more serious. This one would

¹ "Diagnostik u. Therapie d. Darmkrankheiten," Leipzig, 1899, p. 222.

naturally expect, since chronic enteritis with diarrhea, which persists, is usually either complicated by ulceration, or else considerable portions of both the small and large intestines are involved. Moreover, very much more poison is absorbed from liquid feces than from those that remain dry or formed.

The objective symptoms of intestinal catarrh have to do mainly with the character of the stools, as well as with signs to be elicited by palpation and by succussion or clapotage (tapping the abdomen with the finger tips to produce splashing sounds). Inspection of the uncovered abdomen may also afford information, by showing tympanitic swellings over either the whole lower abdomen, or over the cecum or other portions of the intestines. These would render probable the existence of a spastic condition or irregular contractions of the circular fibers of the bowel, though not diagnostic of such a complication.

In any well-marked case of enteric catarrh palpation will generally reveal tender areas corresponding to the locality of the part of the intestine involved, especially when this is the colon, and these will be most readily demonstrated when hard feces are present. Such areas are most commonly found over the cecum, sigmoid flexure, or the middle portion of the transverse colon. If the disease has continued long, you will often be able to detect by deep and careful palpation the appendix, thickened by a catarrhal inflammation and more or less sensitive to pressure. In such cases considerably more muscular resistance will be felt in palpating over the right than over the left iliac fossa. In cases in which there is much catarrh of the cecum, you will likely be able to elicit a splashing sound over that region at almost any time when there is diarrhea, and often in the constipated cases as well, especially a few hours after much fluid has been taken, though this sign may signify merely dilatation of the cecum. The splash may often be obtained over other parts of an atonic colon at a suitable time after taking food or drink. Palpation may also reveal masses of hardened feces in any part of the colon.

All kinds of stools may be observed in chronic enteritis, from thin watery ones passed three to ten times, or even much oftener in the twenty-four hours, to those apparently normal in all respects. Usually, however, more or less mucus will be found with the evacuations—intimately mixed through them, as a rule, when the trouble is mainly in the upper intestine, and smeared over the outside of formed stools when the colon only or chiefly is affected.

A close inspection of the stools, even macroscopically, will often enable you to distinguish particles of undigested food, and by the aid of the microscope you can detect, in most cases of catarrh, undigested muscle fibers, starch granules, lumps of casein, fat globules, etc. Neither blood nor pus is usually to be met with in uncomplicated enteric catarrh of moderate intensity, and when present in considerable quantity would point to complications. Even the entire absence of mucus for long periods does not exclude chronic enteritis, since there may be atrophy of the mucous membrane, or the mucus may be retained in pockets for considerable periods before being passed.

Diagnosis.—Well-marked chronic intestinal catarrh you will easily recognize by the description above given; but the atypical cases may well bother any physician until they have been for some time under observation. The chief distinguishing features are at least a slight, and sometimes very marked, impairment of the general health in connection with pain or discomfort in the bowels, and tender areas over them, irregularity in the character or number of the stools, and usually the frequent or occasional presence of mucus in them. There is also nearly always an excessive formation of gases in the intestines, much of which, however, when the disease is in the upper intestine, may escape upward into the stomach and be eructated. The greatest complaints from bloating or gaseous distention will naturally be made in those cases complicated with constipation. An important confirmatory sign is the presence in the urine of indican or aromatic sulphates, or both,

in excessive quantities, though these may be found also in cancer, tuberculosis, intestinal obstruction, intestinal indigestion, etc., and may, exceptionally, be absent in mild or moderate cases of chronic enteritis.

The greatest difficulty you are likely to encounter will be in differentiating chronic enteric catarrh from nervous forms of diarrhea, resulting from vaso-motor paresis. Boas holds that in some instances the diagnosis between these can scarcely be made. But in genuine nervous diarrhea there is no mucus, and rarely any pain; the stools are not fetid, no indicanuria nor excess of the aromatic sulphates is likely to appear in the urine, and the attacks are usually transient, as well as coincident with an increase in the other neurasthenic or hysteric symptoms. If such diarrheal attacks recur often, and particularly if they incline to linger for days at a time, it may well be suspected that a catarrhal process has been set up. Constipation from stricture, tumors, etc., is to be differentiated also; but when this persists long, a catarrhal process nearly always results.

Above all, do not forget that intestinal catarrh is by no means synonymous with diarrhea, the majority of the cases being accompanied at first, at least, by constipation.

Prognosis.—This is one of the most difficult of all non-malignant diseases to cure. Yet it is always curable by appropriate treatment in the earlier stages, and generally in the later ones, provided the patients can afford the necessary outlay of time and money with, often, prolonged rest from an injurious occupation, and especially if they are willing to change, radically and permanently, the faulty habits as to diet and exercise (often dress as well) which you will usually find to have been prominent in the causation. Even when the appendix has become involved in the catarrhal process, as happens ultimately in a large proportion of prolonged cases, a cure without operative intervention may sometimes reward your persistent efforts; but in the more stubborn cases removal of the appendix is usually desirable, and, in persons

not able to afford a long course of treatment, is often indispensable, especially when there occur occasionally acute attacks.

Treatment.—The dietetic is the most difficult part of the treatment, and the most important. An almost exclusive diet of meat, with a very free use of hot water—the pulp of lean beef, or finely hashed beef or mutton, with just enough of lettuce or celery to act as a relish, and a slice or two of stale bread and butter daily—kept up for a few weeks, will often accomplish brilliant results in controlling catarrh, either gastric or intestinal; but there are important contra-indications to such a regimen. When a dilated stomach, or one with a very poor motor power, coexists, as often happens, the large amounts of water will disagree, unless given one glass at a time, and sometimes even then. When there is a very feeble heart, the superabundance of fluid involves dangers, and when the heart is enfeebled by gouty conditions, that is, overtaxed by forcing the blood through arterioles contracted by the alloxuric bases or other poisons produced in lithæmia, there is the added danger that the overplus of meat will aggravate. Moreover, in patients having rheumatism or arteriosclerosis, as in the case of so many elderly ones, the meat diet often proves harmful.

But even in persons in whom no such contra-indications appear, it is not always safe. I once saw a young lady become insane, as a result apparently of such a diet after a few weeks' use of it; and in any case, it can scarcely be continued in a strict form longer than three or four weeks. Perfect nutrition demands a proportion of about three-fifths carbohydrates and one-fifth fats in the diet, and if the system be long denied a due allowance of these, the metabolism is disturbed.

When the meat diet does not suit, or when the intestinal catarrh persists, after trying it for a sufficient length of time, your best reliance will be upon good stale white or whole wheat bread (not very coarse bran or brown bread) and butter, together with some of the well-baked cereal foods in a dry

form, so as to require thorough mastication and insalivation. Thoroughly cooked rice and gluten preparations are allowable. Eggs, except fried, can also be eaten once or twice daily, and good fresh lean fish may be taken. Fresh milk, preferably boiled or sterilized, and a small or even moderate amount of cream are generally well borne, though there are cases in which they wholly disagree, and Boas taboos milk entirely in this affection. Scraped or hashed meat once or twice a day is desirable in most cases, and sometimes steak, chops, or even tender broiled ham in small quantities, well chewed, agree perfectly. Sugar and the fruits always aggravate in the severer cases, and when there is diarrhea, especially, should be rigorously prohibited. The vegetables are nearly as bad, and though a little celery, lettuce, asparagus tops, or even baked white potato may not always seem at once to disturb, much of them at one time usually does, and the potato especially is likely to increase the fermentation. Summer squash, pumpkin, egg plant, etc., may be cautiously tried in the lighter cases with constipation. All vegetables agree best in purées. Most of them are positively hurtful in well-marked cases of intestinal catarrh. As to beverages, alcohol should be generally avoided, but tea and coffee may be allowed in moderation, provided the patient be not lithæmic. Chocolate and cocoa generally disagree on account of their accompanying sugar and large content of fat, but I have recently been seeing good results in patients who partook moderately of a preparation called Plasmon-Cocoa, which contains no sugar, and yet is fairly palatable and very nourishing. Cereal coffee and hot water flavored with milk, or otherwise, to suit the taste are safe drinks, and in Europe a little claret is often allowed when the gastric juice is deficient. Iced drinks are injurious.

As to the other parts of the treatment, it is impossible to outline any definite course which will cure all cases. Indeed, in no field are experience, diagnostic acumen, an intimate knowledge of all the remedial measures, good judgment, and especially patience, so indispensable.

The fundamental requirements are to bring up the nerve tone and improve the circulation in the intestines by whatever means will best succeed. The most practicable and effective are, in general, the milder forms of outdoor exercise, including golfing, rowing, and horseback riding, together with massage (except when there is hyperchlorhydria, or a spastic condition of the bowels), electricity and hydriatic procedures, such as colonic flushing with mild antiseptic or astringent solutions, and wet packs and jet douches to the abdomen. An equally important thing is to secure good drainage—perfect elimination through the bowels, kidneys, and skin. This can often be accomplished by the above-named measures, and drinking freely—even copiously sometimes—of pure water, when this is not otherwise contra-indicated. In some cases, however, a cautious use of the gentler and least irritating laxatives, such as olive oil, by mouth or enema, Purpetrol, a highly purified preparation made from a Russian coal oil, cascara sagrada, sulphur, or the salines (especially the phosphate or sulphate of sodium) will best effect this object. It is nearly always indispensable that there should be one complete evacuation every day, or at least every other day, but, if possible, this should not be loose—never watery. Even in the cases in which constant diarrhea has become established, flushing the colon with a normal salt solution, followed by injections of antiseptics, and when necessary also an astringent, such as a teaspoonful of bismuth to the pint of tepid water, nearly always gives better results than opiates and astringents by the mouth. These last are rarely necessary, even temporarily, and used long always do harm. Dr. Deardorff of San Francisco recommends in chronic colitis the injection every other evening of several quarts of a normal salt solution, and on the alternate evenings the following:

Ac. carbol.....	3 iss
Glycerin	f 3 iii
Listerin.....	q. s. ad f 3 vi

M. Sig : Add two tablespoonfuls to two quarts of cool or tepid water and inject every other evening.

I have used this in numerous cases with excellent results in nearly all, but have found that carbolic acid, given by the bowel, will aggravate any coexisting hyperchlorhydria almost as quickly as when taken by the mouth.

Recently I have seen a very stubborn case of chronic colitis cured by injections of bismuth with cotton-seed oil. When there is persistent diarrhea, the massage should be light, or omitted, and so also when there is constipation of spastic origin. The milder astringents, such as bismuth, ichthalbin, tannalbin, and tannigen, may also be given by the mouth in 5- to 10-grain doses after every stool, when the bowels are persistently loose.

In all stubborn cases the stomach should be tested by washing out or extracting the contents, four to six hours after a meal, to ascertain the degree of gastric motor power and the character of the chyme being delivered into the intestines—whether or not well digested, and whether irritating from an excess of either free HCl or organic acids resulting from fermentation. When in this way you find the stomach contents excessively irritating from a too high acidity, you will naturally need to remove such a cause of the intestinal trouble, before you can hope to effect a cure. The appropriate treatment of the gastric disease will need to be instituted, and if there be much stagnation, gastric lavage, for a time, will be indispensable.

Supposing the cause or causes to have been removed, the remedies already mentioned will rarely fail to control the symptoms, except in the severest cases. When one or two loose stools recur every morning, I have seen very small doses of podophyllin—grain 1-100 every three to four hours—act most happily in restraining it (see Lecture XXXIV.). Sometimes 1-10 grain doses of calomel every two to four hours prove the most efficient means of stopping the offensive diarrhea which results as a complication from taking cold, or more often from some imprudence in diet. The same small doses of calomel given for one or two days in each week, or until bile-

tinged stools result, are frequently a useful adjuvant in chronic intestinal catarrh.

Various spring waters have been recommended for this affection, including especially those of Carlsbad, Plombières, and Vichy in Europe, and those of Saratoga (N. Y.) and Bedford (Pa.), and they often exert a curative influence; but patients possibly profit as much by the rest from business or social cares, and change of scene at such resorts, as from the medication. The sulphate of sodium, dissolved in hot water, and sometimes combined with a little bicarbonate or chloride of sodium, will usually prove nearly as useful as the imported spring waters taken at home.

In the severe cases having diarrhea, and those in which constipation is complicated with serious nervous exhaustion, rest in bed, for two to four weeks at least, should be insisted upon. This not only secures needed physical and mental rest, but insures better nursing and a closer study of the patient's case by the physician.

In all the cases in which the strength is not seriously reduced, the gymnastic exercises for the abdominal muscles described in Lecture XXIII., or other equally efficient ones, should be practiced daily to increase the tonicity of the musculature, and improve the circulation in the parts. This should not be neglected, even when massage is regularly applied, unless the patient is unequal to any active exercise.

In the more obstinate forms of the disease, a valuable method of treatment to supplement the dietetic and other measures already described, is that introduced by Doumer.¹ It consists of the passage, by means of large flat electrodes, of as full doses of galvanism as can be borne through the abdomen from one iliac fossa to the other. Very large doses can safely be applied in this way. Doumer runs the current gradually up to 70 or even 80 ma. Once a minute he reduces it to 40 ma., and the current having been reversed to produce a momentary shock, the dose is again slowly increased to the

¹ *Gaz. des Hôp.*, October 27, 1900.

former limit. He begins with a ten-minute sitting daily, and later lessens it to three times a week. This is kept up for from four to six weeks.

Other extraordinary methods applicable in stubborn chronic catarrhs of the colon especially, include that by means of hydroelectric applications, which you will find described in Lecture XXVI. and Turck's method by lavage of the colon described in Lecture XXVII.; also the injection of carbon dioxide (CO_2), recommended by Dr. A. R  se and described in Lecture XXVII. Applications of the static wave current over the lower abdomen have proved useful in my experience for such cases.

LECTURE LXVII

APPENDICITIS, ITS SYMPTOMS, DIAGNOSIS, ETC.

INFLAMMATION in the cecal region formerly classed as typhlitis, perityphlitis, or paratyphlitis, is, in accordance with a newer pathology, now called appendicitis. It is believed nearly always to originate in the appendix vermiformis and extend later in a certain proportion of the cases to the surrounding tissues. There is doubtless in most cases a previously existing catarrhal process in the colon, which involves the cecum in a more or less obscure way, not often provoking active or serious symptoms there. Finally, when the process extends to the narrow piece of gut known as the appendix vermiformis, and has produced enough swelling of the mucous membrane of that structure to interfere with free drainage of its contents into the large bowel, threatening symptoms begin. But it simplifies matters to regard the place where the serious symptoms generally arise as the source of the mischief and name the disease accordingly. Very exceptionally, the attack is merely a typhlitis or inflammation of the cecum from first to last, no other structure being involved; but such cases are admittedly rare.

The Different Forms of Appendicitis.—Numerous varieties of appendicitis have been described, and the subject thus quite unnecessarily complicated. For example, the following classes have been named: (1) appendicular colic; (2) simple acute catarrhal appendicitis; (3) chronic catarrhal appendicitis, (*a*) obliterative and (*b*) persistent; (4) interstitial appendicitis; (5) ulcerative appendicitis; (6) purulent appendicitis without perforation or any periappendicitis; (7) purulent appendi-

citis with leaking of pus into the peritoneal cavity through a small perforation or otherwise, producing local peritonitis and a limited walled-off abscess; (8) purulent appendicitis with extraperitoneal, retrocecal abscess from the escape of pus through a perforation into the connective tissue behind the cecum; (9) purulent appendicitis, with large escape of pus through a perforation into the peritoneal cavity and the production of general peritonitis; (10) gangrenous appendicitis.

All the foregoing are possible forms of the disease, or possible developments of an attack which began as a simple catarrhal inflammation of the appendix, or at least extended to it from a similar process in the cecum, which produced no noteworthy symptoms until it invaded the narrower tube, the swelling of whose mucous membrane caused obstruction of its lumen. You should know that what is apparently a simple catarrhal inflammation of the appendix may result in an abscess, or exceptionally take any of the above-mentioned forms, and it is also important to understand clearly that the latter are all merely manifestations of one disease process. A better classification is based virtually upon the degree of virulency of the infecting germs and divides the disease into two forms: (1) the simple catarrhal, and (2) the severe form which is likely to result in the rapid formation of pus, with perforation and possibly gangrene following in a considerable proportion of the cases. The so-called appendicular colic probably never occurs except in an appendix already the site of a catarrhal process; and the ulcerative form may develop from any severe or prolonged case of catarrhal appendicitis. In all the forms there is more or less involvement of the interstitial connective tissue, but in some cases this tissue is predominantly affected.

Ætiology.—The ætiology of appendicitis has been much disputed. The former view was that the disease is always due to the lodging of fruit seeds, other foreign bodies, or fecal concretions in the appendix. A large number of autop-

sies have proved that this, though one of the possible causes, is by no means the most frequent one. Different series of autopsies have revealed foreign bodies or concretions of some kind (mostly fecal) in from one-twentieth to somewhat more than one-third the total number of cases studied. The cause in other cases is traumatism, twisting of the appendix from overdistention of the cecum or ileum, but is most generally in all probability an extension of an inflammatory catarrhal process from the cecum to the mucous membrane of the appendix itself. Both pus cocci and the bacillus coli communis are believed to be able to set up the process, but the latter is by far the most frequent infecting agent.

A. O. J. Kelly of Philadelphia has written the most rational and lucid explanation of the origin and development of appendicitis which has yet appeared anywhere. It forms a part of Deaver's "Treatise on Appendicitis," third edition. Kelly has made a thorough investigation of the subject based upon a careful study of 577 appendices, all but 21 of which were examined microscopically. Calculi, even when found in the appendix, are considered by him to have been the consequence, not the cause, of the inflammation of the mucosa. The swelling of the latter produces frequent occlusion of the tube, as happens in the case of all similar narrow structures lined by a mucous membrane. The occlusion leads to stagnation of the contents, with, as a consequence, increased virulency of the colon bacilli or other germs thus imprisoned.

The pathology is now sufficiently well understood. The inflammation attacks first the mucous membrane of the appendix (swelling and erosion) and then involves in succession the submucous and muscular layers, and, in cases not previously arrested, finally extends to the serous coat, producing a local peritonitis. At a comparatively early stage of the process the swollen membrane may close completely the opening into the cecum, and portions of feces with the secretions of the part may thus be retained and undergo decomposition within the appendix. In favorable cases, especially when the colon is

regularly emptied every day by a sufficient bowel movement, this swelling subsides enough to allow the contents to be expelled, this occurring often after an attack of severe colic (appendicular colic). In less fortunate cases in which the infection is greater, or the recuperative powers of the patient less, and feeding by the mouth not prevented, the occlusion persists, the contents of the appendix become purulent, and we have then established a collection of pus in the appendix which, however, may still possibly find a safe vent spontaneously. Under favorable conditions, even after this stage has been reached, the opening into the bowel is sometimes re-established, and the pus drains harmlessly away. Under less fortunate conditions the walls of the appendix are infiltrated with inflammatory exudate, the adjacent coils of the intestines become agglutinated to the diseased structures, and with or without the escape of a small amount of pus from within the appendix, a true abscess cavity is established which, as a rule, when absolute rest of the parts has been maintained, is completely walled off from the rest of the peritoneal cavity. Such an abscess may rupture into the peritoneum with rapidly fatal results, or into some part of the intestine, into the rectum, vagina, bladder, or any other neighboring viscus which may happen to become attached to the wall of the abscess by adhesive inflammation. Some such opening is the most frequent result in these localized forms of acute appendicitis going on to suppuration, unless complete rest of the body as well as of the gastro-intestinal functions has been maintained by strict confinement to bed and no food allowed except by enemas. With such an opening, except it be into the bladder, peritoneal cavity, or pleural cavity, the result may be favorable and convalescence ensue. When, however, the abscess opens by a large opening into the peritoneal cavity, general peritonitis results, and very often (in one-third to one-half the cases), even in spite of immediate operation, the patient dies. If it should open into the bladder or pleural cavity, the danger of fatal infection is also great. In a large proportion of cases no abscess

forms, the inflammatory process resulting from a true infection involves the various layers of the appendix, including often the peritoneum, and we have developed a mild local peritonitis, which, under appropriate treatment with absolute rest, may terminate favorably in a resolution of the process. In the severer cases the cure is rarely complete, but there is usually left behind a focus of disease in the appendix which, in a majority of instances, is likely to be lighted up again into an acute inflammation at any time later upon a sufficient provocation, such as persistent constipation, prolonged exposure to cold and dampness, etc.

When the infection is particularly virulent, or from any cause there is obstruction of the circulation in the part, the inflammation may take on a gangrenous form and prove rapidly fatal. But in a certain, though probably very small proportion of even the suppurative cases, the cure may be complete. In some of these which go on to abscess formation, the appendix sloughs away and is thus totally destroyed, or an obliterative inflammation may destroy the lumen of the little piece of gut, the sides being agglutinated and a solid structure formed. In still other cases, especially those in which the inflammation does not progress beyond the catarrhal stage, the recovery proves permanent, the infiltrated tissues having undergone resolution, and there is never any recurrence of the attack. This may result from a persistence with appropriate treatment of the constipation and catarrh of the cecum which have been the causes of the disease, and from following thenceforth a more hygienic mode of living as to diet, physical exercise, etc.

Symptoms.—The mildest cases of appendicitis give no symptoms ordinarily beyond a brief spell of colic, or even of a slight dull pain with constipation, or sometimes diarrhea, preceding it. These are now often called appendicular colic. There is little doubt that many of the cases of so-called bilious colic which all of you have seen in practice, and cured rapidly with the help of hot mush poultices and other simple meas-

ures, were mild cases of subacute catarrhal inflammation of the appendix, with temporary obstruction of the opening.

In somewhat more marked cases of acute appendicitis there will generally be present obvious fever, or at least an increased rectal temperature, and also both severe pain and localized tenderness in the right iliac fossa, with constipation or sometimes diarrhea, and usually at the outset one or more attacks of vomiting. You should bear in mind, however, that the pain and tenderness are not always in the right iliac fossa, since the appendix may occupy an abnormal position to the left of the median line, or far below or above its usual site; and even with the appendix in its normal position, the pain at first is often diffused and referred to different parts of the abdomen. In all cases, therefore, of pain and tenderness, in any part of the abdomen, you should think of appendicitis as a possibility.

The pain and tenderness are likely to be greatest at what is known as McBurney's point, which is usually midway of a line drawn from the umbilicus to the anterior superior spine of the ileum. To be more exact, this point of greatest tenderness should be about two inches (5.08 cm.) from the iliac spine, toward the umbilicus in the line just described. In addition to pain and tenderness in this region you will find muscular rigidity, so that palpation of the parts beneath the surface will be very difficult. The right rectus muscle will at least be more rigid than the left. One well skilled in the art of palpation, and especially one accustomed to examine many appendices, can generally make out, in the early stages of acute appendicitis as well as in the chronic forms, an indistinct and often somewhat ill-defined swelling or tumor corresponding to the enlarged appendix with, in severe cases, the infiltrated tissues surrounding it.

The symptom fever may or may not be ushered in by chills, and is by no means always present. In the very mildest, as well as in some of the gravest, forms of the disease, there may be no fever,—at least no rise of the surface temperature or of that in the mouth. Generally, however, there will be an in-

crease of temperature, which in the milder cases is not likely to go above 100° or $100.1-2^{\circ}$, but may rise as high as $103.1-2^{\circ}$ or 104° —or even, in very severe cases with general peritonitis, 105° or 106° —in the rectum.

According to Tiffany,¹ the temperature in appendicitis should always be taken in the rectum, with the thermometer placed as high up as possible. Considerable fever will often be shown in this way when the temperature taken in axilla, or even in the mouth, may be normal. Tiffany insists further that a difference of several degrees between the temperature in the mouth and that obtained high up in the rectum is indicative always of peritonitis.

In the mildest cases of catarrhal appendicitis the pulse may vary little from the normal, but even in these is likely to be somewhat accelerated. In other cases it is generally more rapid than the increase in temperature would lead one to expect. In the severer cases it is nearly always above 100, and may reach 130, 140, or even higher when general peritonitis exists. In all advanced cases there is dorsal decubitus, with the right knee, or sometimes both knees, flexed.

Perforation occurring in an attack of acute appendicitis may lead to merely a slight limited extravasation, with the formation of a local abscess and only a gradual intensifying of the symptoms, or may produce at once grave and threatening symptoms. In many cases there develop suddenly a high rectal temperature, and very acute, often violent pain which may go on to profound collapse when the extravasation is general. The skin then is cold and clammy, and the pulse small and thready, becoming frequently so rapid that it cannot be counted. When general peritonitis has resulted, the abdomen may be either very tympanitic or extremely rigid. Constipation is complete and urination scanty with the onset of general peritonitis, and there develop only too often all the signs of impending dissolution, including cold hands and feet, feeble respiration, and gradually failing circulation. Intellec-

¹ Wood's "Reference Hand-book," last edition; article on Appendicitis.

tion is generally clear, and consciousness in fatal cases persists even to the last.

Diagnosis.—A pronounced case of acute suppurative appendicitis may easily be recognized by even a tyro in medicine, but there are mild and irregular forms of the disease which present many difficulties. It may resemble somewhat a moderate attack of typhoid fever, but the mode of onset and different course of the fever should render the differentiation easy. In the purulent and peritoneal forms there is leucocytosis in appendicitis, but never in typhoid fever. Obstruction of the bowel, strangulated inguinal hernia, movable right kidney, stone in the right ureter or kidney, extra-uterine pregnancy on the right side, the twisted pedicle of an ovarian cyst, or hepatic colic may any of them produce symptoms similar in some respects to those of appendicitis. These, except the last, are devoid of fever ordinarily, and though appendicitis may exceptionally pursue an afebrile course, careful observation should within a short time enable the experienced diagnostician to differentiate them.

Subacute perforation of a duodenal ulcer is often mistaken for acute appendicitis, and occasionally the same has happened in the case of a gastric ulcer, situated at or near the pylorus. Moynihan, quoted by Gibbon,¹ is authority for the statement that of forty-nine cases of perforated duodenal ulcer, a diagnosis of appendicitis was made in eighteen. This could not easily occur in a case previously under the care of an expert diagnostician unless the ulcer had been a latent one. If the ulcer had run its course without the usual symptoms, and the perforation had led to an accumulation of fluid and local peritonitis in the right lower abdomen, it would be impossible, without an exploratory incision, to make the diagnosis from appendicitis.

Pus in the gall bladder, perinephritic abscess, acute tubercular peritonitis, acute hemorrhagic pancreatitis, local peritonitis in women in the region of the right ovary or tube, and right

¹ *Am. Med.*, December 19, 1903.

hip-joint disease at an early stage, are usually characterized by fever as well as pain referred vaguely to the right side of the abdomen, and might possibly in some cases mislead you; but in these the pain would rarely, and the seat of tenderness never, be found at McBurney's point, except possibly in tuberculosis of the cecum, while the mode of onset and other features would generally be very different.

However, you should always think of these different causes when there is pain in the right hypochondriac region, and be able to exclude them before making a positive diagnosis of appendicitis. In case of doubt you should call in consultation a medical expert trained in the diagnosis of abdominal diseases, one capable of giving an authoritative and unbiased opinion as to the need of operative intervention, and it is a wise precaution to have an abdominal surgeon in readiness at least, and, preferably, actually associated in the case from the beginning of the disease.

Physical Signs.—A small tender swelling can generally be made out in the region of McBurney's point at an early stage by gentle but deep and firm pressure, though the extreme tension of the right rectus muscle may prevent, and this marked tension is itself a valuable diagnostic sign. Later, in severe cases with much infiltration or oedema of the surrounding parts, a large doughy mass can nearly always be felt. Examination with the finger per rectum, or in women per vaginam, with bimanual palpation will help to make the diagnosis, especially when the pain is referred to the pelvis and external palpation does not afford conclusive information. Percussion may give a dull note over the tumor when this is very superficial, though more frequently there is tympany from portions of the intestines lying above it.

The pulse is usually from 90 to 100 in the catarrhal cases, but much higher in the purulent and peritoneal ones, frequently running up to 120 or 130, even in the absence of perforation.

Clinical Course.—Appendicitis may exceptionally be slow and gradual in onset, but generally begins abruptly and, in the

severe cases, often with a chill followed by fever. In the milder catarrhal cases the pain is only moderate and is relieved by appropriate treatment. Improvement under favorable conditions sets in soon and goes on to recovery.

In the fulminating cases all the symptoms—pain, tenderness, fever, and vomiting—are likely to be severe from the start, and, except the last, which may be wanting altogether, increase in intensity as the disease progresses. Sudden cessation of pain and of surface fever is a bad sign, pointing to gangrene or perforation and general infection of the peritoneal cavity.

In other cases general peritonitis may develop insidiously, with no such marked change in the symptoms. There may be a rise or little change in the temperature, and almost the only sign of the serious turn in the case may be a gradually extending area of acute tenderness on palpation, with increased tympany, and a more anxious expression of the face. With such a development, whether it be sudden or gradual in its manifestations, the patients in a large proportion of cases, under the usual methods of treatment, grow steadily worse until death closes the scene.

When a gangrenous condition of the appendix supervenes the more alarming symptoms, including especially fever and pain, often abate, and unless you are on your guard the apparently favorable change may mislead you and cause you to relax your vigilance. Then a sudden rupture of the abscess, collapse, and speedy death threaten the patient unless operative intervention, or a strict persistence with rest in bed and the absolute withholding of food, drink, and disturbing medicines by the mouth, according to the method of Ochsner,¹ succeeds in averting the danger.

Chronic Catarrhal Appendicitis.—In a considerable proportion of the cases of apparent recovery from acute catarrhal appendicitis, and usually when the suppurative cases pursue a favorable course without operation, there is left behind a dis-

¹ *Int. Med. Mag.*, November, 1901.

eased mucosa in the appendix, which is prone to exacerbations and recurrent acute attacks depending upon the occlusion of the opening by infiltration and inflammatory swelling. Such a condition is called chronic catarrhal appendicitis. The same condition in mild form probably nearly always precedes the first acute attack (except when the latter results from traumatism or the lodging of a foreign body), and there are good reasons for believing that it exists unrecognized for months, and sometimes years, in large numbers of persons. Many of these latent cases under favorable conditions recover spontaneously. The disease can very generally be held in abeyance, and in the majority of cases be gradually improved, a cure finally resulting in the more fortunate ones; but taking men and women as they are, prone to be careless in diet, the disease is very likely to return.

Woods Hutchinson¹ has shown that there is a natural tendency with advancing years for the lumen of the appendix to be obliterated by atrophy and that, therefore, after thirty years of age the danger of developing acute appendicitis steadily lessens. According to the same authority, nearly 70 per cent. of all persons over sixty-five have the lumen of their appendices permanently closed, so that they could not have an attack of appendicitis under any circumstances. Hutchinson, who is an English pathologist of note, announces himself as a convert to the starvation method of Ochsner described further on, having seen remarkable results from it.

In this form of appendicitis there may be no *symptoms* at all for a long time, the disease running an entirely latent course, except that often it may be noticed by the patient or his friends that he is less vigorous or enduring than previously, or has a less ruddy color. Usually, however, there are manifold disturbances of the digestive and nervous systems, including constipation, which sometimes alternates with diarrhea, intestinal flatulence, which is often very troublesome indeed, dull headaches, impaired sleep, and in short all

¹ *Am. Med.*, August 1, 1903.

the symptoms generally described as characteristic of neurasthenia. It is often associated as a consequence, according to Edebohls, with a movable right kidney, and in the earlier stages of such cases there is generally hyperchlorhydria.

The *diagnosis* of chronic catarrhal appendicitis requires an unusual degree of skill in palpation. It is difficult, except in very thin persons, to make out the normal appendix, but one which is swollen by catarrhal inflammation should generally be felt by an adept in palpation, except when the abdominal wall is very thick or the cecum is loaded with feces, or the surrounding tissues much infiltrated, as occurs after a recent acute attack. Edebohls and others have laid down elaborate directions for palpating the appendix, but the matter may be summed up in a few words and arranged under these three heads: (1) Have the sense of touch in your finger ends highly educated; (2) get the patient to relax the abdominal muscles completely, which is usually best accomplished by having him lie on the back with the knees flexed over a pillow, and making a few gentle stroking motions upon the abdomen, but sometimes relaxation can only be caused by putting the patient in a warm bath; (3) stand on the patient's right side, and with one hand applied flatly against the abdomen, press the finger tips downward steadily, but gently at first so as not to excite contractions, and while you engage the patient in conversation so as to divert his attention as much as possible from what you are doing, press them firmly on down until finally you can feel the structures on the back wall of the abdomen. Then, if you will draw the fingers slowly from the umbilicus toward the anterior superior spine of the ileum on the right side, you should be able to distinguish an enlarged appendix as a little-finger-shaped resisting body which, whenever pressed upon, is likely to be extremely sensitive, whereas the normal appendix is not at all sensitive. There is sometimes an advantage in pressing with the left hand over the right or palpating hand. When the appendix is even slightly affected, the right rectus muscle is always very tense. Finding a very sensitive spot at

or near McBurney's point is not diagnostic of appendicitis, because this may be found in catarrh of the cecum merely, and especially in such a condition complicated by ulceration. Neither will the failure either to feel the appendix thickened, or to find a sensitive spot in its normal site enable you to exclude the possibility of chronic appendicitis, since it may be displaced to some other part of the abdomen, or be behind a cecum which is full of soft feces.

Prognosis.—The question as to the prognosis of appendicitis has been greatly complicated by the controversy long waged as to when surgery should be invoked. Keen and White give the mortality of "appendicitis and the attending perityphlitis and paratyphlitis" as 12.5 to 14 per cent. (one out of seven to eight cases)¹ and various other estimates have been given, all of those covering large series of cases referring to patients treated in hospitals.

In private practice the mortality including all the forms of the disease, the lighter catarrhal cases as well as the severer ones, is very much less. Ewald has put himself on record ("Twentieth Century Practice") as believing that at least 90 per cent. of all cases recover under medical treatment alone. Hemmeter² cites Hertzog as reporting 285 cases treated by medical means only with an average mortality of 14 per cent.; 240 of these were circumscribed perityphlitis with a mortality of only 1.6 per cent. and 36 cases of diffuse perityphlitis with a death rate of 100 per cent., there having been no recoveries. Hemmeter has collected 32 cases of appendicitis occurring in private practice between 1899 and 1901, without any deaths, 23 of these having received medical treatment only. Two of the latter relapsed within five years, but the relapses were recovered from without operation.

Richardson, cited by Da Costa,³ made an elaborate study of 750 cases from which there was shown in operated cases a

¹ "Am. Text-book of Surgery," 4th ed., Philadelphia, 1903, p. 839.

² "Disease of the Intestines," Philadelphia, 1902, p. 389.

³ "Modern Surgery," Philadelphia, 1900, p. 793.

mortality of 18 per cent.; while the same surgeon, in a later paper,¹ reports 520 acute cases observed by him with a mortality of 16.4 per cent. under medical treatment, and 21.75 per cent. among those operated on. Richardson, in a recent lecture,² reports that at the Massachusetts General Hospital during 1901 there were 185 operations for acute appendicitis, with 30 deaths, or 16.18 per cent.; 41 of these operations were in cases complicated with general peritonitis, with 25 deaths—60 per cent. But in the operations for chronic appendicitis, interval operations, etc., 52 in all, there were no deaths.

The foregoing figures, however, are altogether too high for present conditions. Deaver, who operates in nearly all cases, and with a skill unsurpassed, has recently reported³ 377 acute cases exclusive of those having general peritonitis, with a mortality of less than 7 per cent., and both his and Richardson's last large series of operations in chronic cases (interval operations) were wholly without deaths.

Ochsner of Chicago, who practically never operates after the disease has extended beyond the appendix itself until the attack is over (except to open a circumscribed abscess), but relies upon non-operative methods of treatment during the acute stage after the first day or two, treated in the Augustana Hospital during the calendar year 1902, 192 acute cases with 6 deaths, about 3 per cent.⁴ Fuller statistics of the mortality in this disease under operative and non-operative measures are given in the succeeding lecture on Treatment.

When an appendiceal abscess opens into the peritoneal cavity, the pleural cavity, or the bladder, the peril to life is great, and a very large proportion of such cases under the methods hitherto in vogue, whether with or without operative intervention, have proved fatal, though Ochsner has reported one large series of perforative and gangrenous cases treated by

¹ *Am. Jour. Med. Sci.*, December, 1899.

² *Old Dominion Journal*, January, 1903.

³ *Am. Med.*, October 17, 1903.

⁴ *Med. News*, Philadelphia and New York, May, 1903.

his new method with only 5 per cent. mortality.¹ Every recurrence of appendicitis increases the danger of a fatal termination. Removal of the appendix during the first thirty-six hours, or before the disease has extended beyond that structure itself, involves a very small risk, the mortality in good hands now not exceeding 2 or 3 per cent., and in the best hands in well-equipped hospitals is generally much less—scarcely 1 per cent.

Under appropriate medical treatment alone, catarrhal appendicitis nearly always gets well—or, at least, the attacks are recovered from. A considerable proportion of the patients do not have any further trouble, and it is probable that few of them would relapse if the best possible treatment were strictly followed afterward, including proper diet; but unfortunately this can seldom be insured. Woods Hutchinson quotes the late Fenger, one of the most brilliant surgeons this country has produced, as stating that “about one-third of the severer type of cases recovering from one attack would probably never have another.”

¹ *Int. Med. Mag.*, November, 1901.

LECTURE LXVIII

THE TREATMENT OF APPENDICITIS

THE treatment of appendicitis is one of the earnestly discussed questions of the day in the medical circles both of Europe and the United States. In this country, where its true nature was first clearly pointed out, by Fitz of Boston in 1886, the disease is treated with a greater degree of success than anywhere else in the world, because in part, no doubt, of its unusual prevalence here.

Three different views as to the treatment are now advocated, and there is no reason to doubt that the champions of each are equally honest and conscientious. These are as follows:

1. **The Radical Surgical Method.**—This is ably championed and very successfully carried out in practice by Deaver, Price, and others of Philadelphia, as well as by Morris of New York, and Murphy of Chicago, among others. They hold that appendicitis is exclusively a surgical disease, and that to delay operation and depend upon any kind of non-operative measures at any stage is nearly always only a waste of time which endangers the patient. They would, as a rule, operate in any stage of any form or grade of the disease in the majority of instances, except when the patient is moribund or so near it that the shock of the operation must inevitably prove fatal. They believe that the promptest possible operation is in nearly all cases the truest conservatism.

2. **The Conservative Surgical Method.**—This seems to be favored by a majority of all the well-known surgeons of the United States and of the world, including Richardson of Boston, Wyeth of New York, Park of Buffalo, and in Philadelphia the following authors of works on surgery or gynecology: Keen, White, Martin, Willard, Montgomery, and Da

Costa, and a long list of others, besides prominent surgeons, too numerous to mention, in all the large cities.

This method differs from the radical one mainly in deferring operation under certain conditions—especially in most cases not seen early—until after the acute attack has ended, and then doing in most instances the very much safer interval operation. The conditions which should lead to a postponement of operation, and a dependence for the time upon other measures, vary considerably with the different surgeons. Most of them agree in not advising operation during the acute stage after the second day, or rather after the disease has progressed beyond the appendix itself, unless there is a walled-off abscess, or unless perforation or gangrene has resulted. Many of them, also, prefer to trust to nature and non-operative methods of treatment in the milder catarrhal cases, even when these are seen early.

When they withhold the knife, the numerous conservative surgeons differ again considerably in their therapeutic measures, but most of them keep the bowels open by means of calomel or salines, and feed lightly with liquid diet, though Richardson seems to have adopted, for cases in which operation must be deferred, the Ochsner practice of washing out the stomach, prohibiting physic, and allowing no food by the mouth. Probably some of the others have recently modified their methods in like manner.

Nearly all employ emollient or revulsive local applications including poultices or wet compresses as hot as can be borne, or, in the more severe cases, rely upon ice locally. Most advise only a very sparing use of opiates, when necessary for severe pain.

3. **The Ochsner Plan, or Surgico-Starvation Method**, is radically surgical in the main, but combines the practice of the so-called conservative surgeons in some respects, along with a most rigorous withholding from the upper gastrointestinal tract of anything, either food or medicine, which could produce peristaltic action. Ochsner of Chicago first began

putting it systematically into effect about the year 1898, and it has already attracted wide attention. He is a believer in the doctrine that every case of appendicitis should be operated at some time, but holds that it makes a vast difference in the results at what stage of a case the operation is done. He insists that every case, no matter how mild, should be operated when the opportunity is afforded to do this during the first thirty-six hours, or at least before the disease has progressed beyond the appendix itself, but that when this cannot be done, it is best to wait until the attack has entirely passed over, unless during the acute stage there should be developed a circumscribed abscess, when this may be opened and emptied. When gangrene or perforation has occurred, he particularly objects to operation, believing this to be more dangerous than waiting, provided his rest and starvation method is strictly carried out.

Acting on the theory that the danger in appendicitis is chiefly in the spread of the infection to the entire peritoneal cavity with the result of a general diffused peritonitis, which often follows an operation in an advanced case of acute appendicitis, Ochsner enforces absolute rest of the body, and of the gastro-intestinal functions in particular, by first washing out the stomach with plain water or normal salt solution, to remove any remains of a previous meal, and then prohibiting absolutely all food by the mouth as well as the administration of any remedies such as cathartics, which could excite peristaltic action.

It will be obviously fairer to him to let him describe his method in his own words, and I therefore quote the following from his latest paper:¹

Ochsner's Description of His Method.—"In every case of acute appendicitis entering the hospital, all food by mouth and all cathartics were prohibited. In case the patient suffered from nausea or vomiting, gastric lavage was at once employed. In the milder cases the patient was permitted to rinse the

¹ *Med. News*, May 2, 1903.

mouth with cold water and to drink small sips of very hot water at short intervals. In the severer cases the patient was permitted to rinse the mouth with cold water, but was not permitted to drink either hot or cold water for the first few days until the acute attack had subsided, when the use of small sips of hot water was begun. If the nausea persisted, gastric lavage was repeated once or twice at intervals of two to four hours, in order to remove any substance which had regurgitated into the stomach from the small intestines.

"The patient was supported by nutrient enemata consisting of an ounce of one of the concentrated predigested liquid foods in the market, dissolved in three ounces of warm normal salt solution introduced through a catheter, which was inserted a distance of two and one-half to three inches. In case this gave rise to pain or irritation or nausea, it was interrupted for twelve to twenty-four hours at a time. In cases in which no water was given by the mouth, an enema of eight ounces of normal salt solution was given four to six times a day, in addition to the nutrient enemata. In cases operated during the acute attack, this treatment was continued for several days after the operation.

"After the patient had been free from pain, and otherwise practically normal for four days, he was first given from one to four ounces of weak beef tea, preferably prepared from commercial beef extract, every two hours. In a few days one of the commercial predigested foods, dissolved in water, was substituted; still later, equal parts of milk and limewater; then general liquids; then light diet, and finally, after the patient had fully recovered, full diet was given. The commercial extract of beef was chosen because it contains only soluble material, which will usually be absorbed from the stomach without giving rise to peristalsis. The rectal feeding was continued in the mean time. By following this plan the patient is satisfied, and one is less likely to do harm with this than any other form of food. Of course, the benefit to the patient is chiefly imaginary.

“So far, nothing has been said of the operative treatment, intentionally, because the treatment I have just described was applied to all cases of acute appendicitis, without regard to the severity of the case or the stage at which the patient was admitted to the hospital. Moreover, because this is the part of the treatment which is responsible for the enormous reduction in the mortality.

“*Operative Treatment.*—The rule which was followed as regards the time of operation varied with the individual cases. In any given case, the operation was performed at the time the patient entered the hospital, or, if this occurred at night, on the following morning, provided it seemed clear from the condition of the patient that he would recover if the operation were performed at once, judging from my own experience in similar cases treated in the past. This could usually be expected in severe cases admitted before the end of thirty-six hours from the beginning of the attack, and in the milder cases during a longer period.

“In all cases in which the recovery seemed at all doubtful, the operation was postponed and the patient was placed under the treatment described above, until the acute condition had subsided. In some of these cases it became necessary to open a circumscribed abscess, and later to make a second operation for the removal of the appendix. In other cases the inflammation became circumscribed, and the appendix could be safely removed, the pus sponged out of the circumscribed abscess, the abdominal wound could be closed, a drain being introduced through a small incision two inches externally to the abdominal incision.”

The foregoing is a plain and fair statement of the different methods practiced, and of the points at issue between them. The latter ought to be decided in an entirely dispassionate way, the same as any other purely scientific question, without the slightest regard to any consideration except the interests of the patients whose lives are at stake. I have given the matter much thought and study, feeling that the words of an

author upon any such important subject should be very carefully weighed.

The Results Must Decide.—Obviously the decision as to which of various methods of treatment is best in any disease, must depend upon the relative results achieved under each of them. So it must be in deciding what method of treating appendicitis is to be preferred. That one which will save the largest proportion of lives will, of course, be finally accepted. Though it is true that figures can sometimes be made to lie, the statistics as to the results in a sufficiently large aggregate of cases must ultimately decide all such questions.

In addition to the figures given under the head of Prognosis, in the preceding lecture, the following, embracing the results of several prominent surgeons who differ in their views regarding the time to operate in appendicitis, will shed some light upon the subject:

Richardson's Results in 1903.—Dr. M. H. Richardson of Boston, who is one of the most eminent of those surgeons whom I have classed above as "conservative," has, in answer to an inquiry from me, submitted the following report under date of January 7, 1904:

Total number of cases operated on in 1903.....	149
Acute.....	44
Chronic.....	105

"In the 44 acute cases there were two deaths, both from general peritonitis. In these cases recovery was not expected."

He added that he could not say how many cases of general peritonitis there were, but had never in his experience known a fully developed case of the kind to recover.

Dr. Richardson's mortality rate in acute cases figures out 4.54 per cent.; in chronic cases 0.

Dr. W. Wayne Babcock, the Surgeon-in-Chief of the Samaritan Hospital, Philadelphia, has written me a personal communication under date of December 17, 1903, embodying the following report of his recent results in operations for appendicitis:

Report of Babcock's Operations.—"In comparison with the treatment of appendicitis by non-surgical measures, my experience, while not extended, is somewhat interesting.

"My rule is to subject all patients, who give evidence of threatened or present gangrene or suppuration, at once to the knife. The result has been that over one-third of my patients of this type have been operated upon at night. The majority of the patients had been under medical treatment before I saw them, with rest, ice bags, enemas, and oftentimes salines. Operation has never been withheld because of the advanced septic condition or asthenia of the patient. In one instance, a patient previously seen by several very prominent physicians who had discountenanced operative intervention, death occurred while I was seeking surgical assistance.

"All patients that I have operated upon during the interval, or at the beginning of the attack,—before rupture had taken place,—have made good recoveries. Those cases without perforation, gangrene, or abscess I will exclude, as they have no bearing upon the special method of treatment employed. Of patients with a more or less localized peritonitis, the result of gangrene or perforation, with the production of circumscribed or diffuse purulent peritoneal exudation, I can recall 15. Their histories indicate that in 5 of these patients the condition had existed less than forty-eight hours, while in 10 the duration had been between forty-eight hours and two weeks (the *non-operative* period of Ochsner). In all the appendix—no matter how adherent or difficult of access—was removed, and the circumscribed adhesions divided; but a special technique, which aims to secure free drainage with a minimum trauma of the intestinal coils, was employed. All of these patients made good recoveries.

"I have operated in three advanced cases of generalized septic peritonitis. The first had a gauze drain that extended nearly from the liver to the side of the rectum, and recovered; the second, operated upon in Auburn (N. Y.), when nearly *in extremis*, died. The third, a very obese woman operated upon

quite recently, did not present the symptoms of appendicitis, but rather of mischief in the upper abdomen. As a result, the usual technique was not carried out, but a high median incision made with a fatal result.

"With my present technique, my rather limited experience indicates that immediate intervention in nearly all cases of appendicitis, with perforation or gangrene, reduces the mortality and morbidity of this affection. The method of Ochsner, at the most, should be reserved for certain advanced cases of generalized septic peritonitis."

The following further statistics covering the most recent work of Deaver and Ochsner, especially, are of great interest, not only as demonstrating the extraordinary advances recently made in lessening the mortality of appendicitis by the chief exponents of two very different methods of treating it, but also as showing the comparative results of these different methods—the one depending on non-operative measures in most cases during the serious stage, and even in the gravest complications, and the other relying upon the aseptic knife and deft fingers of the expert surgeon, operating nearly always, early if possible, but if not, then operating anyway, as a rule (to which he makes some exceptions), in accordance with the view that this affords the patient the best chance of recovery.

Deaver's Last Year's Work.—Deaver, in a paper entitled *One Year's Work in Appendicitis*,¹ reported his operations from September 1, 1902, to September 1, 1903, as follows:

16 cases with general peritonitis with 5 deaths; mortality...	31 per cent.
183 acute cases with abscess, 22 deaths;	" 12 " "
194 acute cases without abscess, 3 deaths;	" 1½ " "
173 cases of chronic appendicitis, 0 deaths;	" 0 " "

Ochsner's Last 566 Cases.—Ochsner, in response to a request for his latest statistics wrote me under date of December 5, 1903, that the results of treatment in the last 566 cases

¹ *Am. Med.*, October 17, 1903.

treated by him in the Augustana Hospital, Chicago, were as follows:

Number of cases of appendicitis with general peritonitis, 15;	
recovered, 9; died, 6; mortality.....	40 per cent.
Number of cases of acute appendicitis with abscess, 81;	
recovered, 80; died, 1; mortality.....	1 $\frac{1}{4}$ per cent.
Number of cases of acute appendicitis without abscess, 173;	
recovered, 170; died, 3; mortality.....	1 $\frac{1}{2}$ per cent.
Number of chronic and interval cases, 297;	
recovered, 295; died, 2; mortality.....	$\frac{2}{3}$ per cent.

Dr. Ochsner supplemented his report with the following statement: "This table contains two deaths in cases of diffuse peritonitis which were not operated, because they seemed in a hopeless condition when they entered the hospital." Omitting these, the mortality in the cases of diffuse peritonitis would have been 30.7 per cent. In a subsequent communication, Dr. Ochsner stated that the remainder of the cases which proved to have general peritonitis were all operated at a time when it seemed probable that the infection was still limited to the appendix. He added: "The acute cases which came too late for this were all placed under the starvation treatment—rectal feeding and gastric lavage—until it seemed safe to operate either because a circumscribed abscess had formed which could be safely opened, or until the attack had subsided and an interval operation was possible."

Deductions from the Foregoing Statistics.—From the above array of statistics a few very interesting and highly important inferences are clearly deducible:

1. The most expert abdominal surgeons, whose ranks are rapidly enlarging by the addition to their numbers of many exceedingly expert young operators, when surrounded by the assistants and appliances of their own hospitals, can operate hopefully upon almost any case of appendicitis at any stage, though, when there has developed general peritonitis, about one-third die. In the chronic form of the disease they very rarely now lose a case. In any acute case operated during the

first thirty-six hours their mortality is extremely low, not often averaging more than 1 per cent.,—and even at a later stage of the ordinary acute cases, when general peritonitis has not developed, the figures are still very favorable. Deaver's 194 simple acute cases, with only 3 deaths—1.5 per cent—make a remarkable showing. Though in a much smaller number of cases, Babcock's total absence of mortality, in all cases except those complicated by general peritonitis, is exceedingly creditable.

2. Regarding perforative or gangrenous appendicitis, and those cases in which general peritonitis exists, the statistics so far reported leave some doubt whether the accepted surgical plan of operating at the earliest possible moment after the discovery of the condition is able to save as large a proportion of lives as can be saved by the Ochsner method already described, even when the operation can be done under the exceptionally favorable conditions above mentioned. When the operation must be done, if at all, by a surgeon not indubitably of the very highest skill, or under conditions unfavorable in any other respect additionally to the serious form of the disease, there can be no question that the Ochsner method would promise best, especially if the previous treatment had not involved the administration of food by the mouth. The sum of the acute cases with abscess and those with general peritonitis in each of the foregoing tables of figures may be taken to include the whole number of gangrenous and perforative cases, and the mortality in the total of such serious cases reported by Ochsner in his last 566 cases of all kinds, figures up 7.3 per cent., which is very much less than the corresponding death-rate calculable from the figures reported by any of the other expert surgeons who have lately published statistics of large series of cases.

It is a fair inference, therefore, that perfect rest and the starvation plan will rescue a larger proportion of the more dangerous forms of the acute cases than operation, by even the very best abdominal surgeons. At least this seems to be

true as regards the latest statistics of the two methods which are obtainable ; but the surgeons are constantly improving their technique and lowering the mortality rate, and it is by no means impossible that the statistics for the year 1904 may tell a different story.

3. The belief that almost any sort of surgery is safer in acute appendicitis than the very best possible non-operative treatment is no longer defensible. It has been gaining ground rapidly of late, both in the medical profession and among the laity. I do not think it was ever quite true, even before Ochsner formulated his method and published his statistics. In view of the latter, however, it is certainly a very dangerous doctrine to continue preaching now. In the country districts, and everywhere remote from the larger cities, where alone really skilled and experienced abdominal surgeons are to be found, as a rule, the Ochsner method should clearly be preferred, operation being deferred—in all cases, at least, in which an operation cannot be done during the first two days—until after full convalescence, when an operator of even ordinary ability and experience could, with reasonable safety, undertake the task of removing the appendix, provided he had mastered the technique of abdominal sections.

4. The most obvious and important inference to be made from the statistics of Ochsner, when these are compared with the results of all the other methods, is that no patient threatened with acute appendicitis, or with any disease resembling it, should be given even the slightest amount of food by the mouth till all danger of suppuration has passed, and no purgative or laxative medicine, except when the patient is seen early enough to admit of the bowels' being cleared out safely before pus could have had time to form in the appendix.

This would be a safe rule for all such cases, regardless of what the after-treatment might be. Even if operative intervention were to be resorted to later, the patient's chances would be improved by such a preliminary treatment, and if a skilled surgeon could not be obtained in time, a life that might other-

wise have been sacrificed would probably then be saved by continuing strictly the Ochsner method.

A Symposium on Appendicitis.—As editor of the *International Medical Magazine* I arranged for a symposium on appendicitis in that journal for November, 1901, and received papers or answers to questions upon the subject from sixteen prominent authorities. Ten of them, viz., Wyeth, Park, Morris, Ochsner, Murphy, Willard, Martin, Richardson, Turck, and Stockton, nine of whom, including all but the last named, were surgeons, answered specifically the following question: "Generally speaking, what mode of treatment do you advise during the first two days of a mild or moderately severe attack of appendicitis?" Of these ten answers, three unqualifiedly favored operation under the conditions named, these coming from Morris, Murphy, and Ochsner. The last named, while advocating operative intervention in the first two days in all cases when a competent surgeon can be obtained, opposed operation in perforation or gangrene. His answer as to the preferable treatment in an acute case, after the beginning of the third day, was as follows: "Exclusive rectal feeding, no nourishment of any kind nor cathartics by the mouth; gastric lavage. If this is done, the condition will not grow worse."

Seven of the answers above mentioned, all but one from men who have had experience in making abdominal sections, advocated relying upon some form of non-operative treatment during the first two days of a mild or moderately severe attack of appendicitis, though several of them spoke of being in readiness to operate in the event of threatening symptoms. Including Ochsner, then, eight of the ten writers who answered the questions favored a reliance upon medical measures either during the first stage of a mild attack, or during the acute stage after the first two days, whenever there are indications that the infection has extended beyond the appendix itself.

Richardson's Conservative View.—Richardson, in the quite

recent lecture by him already cited, says: "My own views briefly are that operation is indicated in most, if not all *severe* cases [*italics ours*] when first seen, unless the symptoms are unquestionably improving, or unless the patient is hopelessly moribund. In many cases of moderate severity I wait for complete subsidence of the infection, as in the present case, before opening the abdomen." Again, in the same lecture, he says: "When it is clear that operation will take away the only chance that the patient has, I refrain from intervention, trusting to gastric lavage and rectal feeding, as suggested by Ochsner." The champion of absolute rest for both the body generally and the peristaltic apparatus in particular, from the very beginning of the treatment, might reply to the last sentence above quoted, that cases which have been regularly fed by the mouth from the outset, and purged freely in addition, could hardly be saved by the adoption of his method at the last, after their condition has become too desperate for operation.

The Treatment of Acute Catarrhal Appendicitis.—The treatment which I have found successful in acute catarrhal appendicitis consists of rest in bed, and when possible, in a cheerful, well-lighted, and well-ventilated room, the application of hot mush or flax-seed meal poultices over the affected region, every two or three hours, or oftener when the pain is very severe, and the administration of calomel in 1-10 grain doses every two hours, night and day, till the bowels respond by one or two soft yellow stools—not until it produces free purgation, and not followed by saline cathartics to effect such a result. The calomel given in this way has always seemed to assist markedly in removing all symptoms of the disease, and the cures thus effected have comparatively infrequently in my experience been followed by any return of the trouble. In view of Ochsner's extraordinary results I should now advise the utmost caution in the employment of even the small doses of calomel above mentioned, and limit the use of the remedy to the earliest stage of the milder cases not likely to develop

suppuration, or to the very beginning of severe ones. As to diet, my own experience in this class of cases has been with a very restricted and simple diet consisting of small quantities of broth or beef juice, or whites of eggs, and a little milk or gruel. Again profiting by Ochsner's experience, and in view of the fact that even the milder catarrhal cases may exceptionally take on later a severe form, I now advise feeding by the rectum exclusively in all cases of appendicitis until the danger is entirely over, since there is no difficulty in maintaining nutrition by this method for the short period necessary, especially in the case of a person strictly confined to bed, and nothing is then put into the upper part of the alimentary canal to provoke peristalsis. It is furthermore a valuable precaution to wash out the stomach at the start so as to prevent danger from the food previously taken.

In the beginning of the attack, and especially when there has been constipation previously, the colon should be unloaded by flushing with either a normal salt solution or soapy water, or what is safer whenever the temperature is at all high and suppuration is to be feared, by repeated injections of olive or cotton-seed oil, which will usually effect the object almost as surely, if not quite so promptly, and without irritation. At the same time 1-100 to 1-50 grain of atropine may be injected hypodermically, and be repeated cautiously till its constitutional effects have been obtained, when necessary to relax spasm and promote evacuation, especially in case the difficulty of procuring a stool seems due to a spastic condition.

Large disturbing enemas as a means of emptying the colon should not be employed, in my opinion, whenever there are evidences of peritonitis, either local or general, since only harm can result from opposing in any manner nature's conservative efforts to prevent peristalsis in such conditions. When the above-mentioned milder injections fail, though it be apparently in an early stage only of the attack, and no peritonitis is believed to have yet developed, do not try to force bowel movements by stronger or more irritating ones lest

peritonitis should have begun, even though not yet demonstrable. I still remember very vividly my appendicitis cases of twenty to twenty-five years ago, then called typhlitis or perityphlitis, and especially how every attempt to force bowel movements even by enemas aggravated the inflammation and fever, turning the scale against the patient sometimes, when before things were progressing favorably.

In cases more severe with a temperature running up to 102° or higher, and acute tenderness over a larger area, ice bags or an ice coil may prove more effective than hot applications—and a little opium may be found necessary to blunt the pain, but the latter remedy should never be pushed to the point of complete narcosis, since this would greatly obscure the progress of the case, and add to the dangers of the patient. When such marked symptoms occur early—within the first thirty-six hours—they raise the suspicion that the attack is to be more than a simple catarrhal one, and would warrant your calling a surgeon in consultation to consider the propriety of an operation while yet the disease is limited to the appendix—or at least to a circumscribed abscess. Much better than a free use of any opiate is a reliance in part upon belladonna or atropine, which possesses valuable antispasmodic properties, and should be particularly effective in relieving pain due to the spasmodic closure of the appendix at its cecal end, or to complicating colics in other parts of the intestines resulting from like spastic conditions.

Treatment of the Severer Forms of Acute Appendicitis.—

In cases which begin in a severe and threatening way (fulminant cases) operation during the first thirty-six, and possibly during the first forty-eight hours, promises better results than any medical measures, always provided that a thoroughly expert laparotomist can be had, and that in other respects the conditions are such that a perfectly aseptic operation can be done. If the patient occupies a dirty room far from any hospital, and cannot command the services of both a skilled surgeon and trained surgical nurse, the advantages of opera-

tion during the height of the attack compared with rest in bed, abstinence from food and drink by the mouth, as well as from purgative medicines, and the help of other appropriate measures, would be more than doubtful. In any case not diagnosticated until after the first thirty-six hours, you will, as a general rule, to which there are few exceptions, be safe to advise against operation until after the subsidence of the acute stage, provided the method by enforcing complete abstinence from stomach feeding and purgatives be strictly carried out. One of the few exceptions would be cases in which a circumscribed abscess has formed, which can be opened easily without danger. But in every severe case of acute appendicitis it is a wise precaution to have a surgeon in consultation until the danger point has been passed.

Whatever views one may hold as to the time for operation in these cases when suppuration exists or is threatened, it must be admitted that non-operative treatment is often the only kind practicable, for the reason that the patient refuses to have the operation done, or because it is impossible to obtain, in time, a surgeon possessed of sufficient skill and experience to do it with the prospect of any more favorable results than would follow the best medical treatment. Furthermore, when the diagnosis has not been made or the consent of the patient and family obtained to an operation until after the second day, and a circumscribed tumor has not yet been formed, non-operative measures are to be preferred till the acute stage has passed, or a walling in of the abscess been fully accomplished. Under these circumstances you should pursue the same course advised already for the mild catarrhal form, except that under no circumstances should anything, either food, drink, or medicines, be given by the mouth which could tend to excite peristalsis—*i. e.*, no stomach feeding, no drinking, and no cathartics or laxatives at all. Dr. R. G. Curtin of Philadelphia reports excellent results from the application of a blister over the cecum in the beginning of acute appendicitis.

The Treatment of Chronic Catarrhal Appendicitis.—Here again, I must take issue with the more radical of the surgeons, as well as with Ochsner, and advise against the hard and fast rule that all cases without exception which have shown indications of a slight involvement of the appendix in a catarrhal process should be operated. I have seen such cases get apparently well under medical treatment, and the easily palpated, thickened appendix subside to its normal size while its tenderness on palpation disappeared. It is granted that other cases not under strict treatment recur again and again, and often finally in a serious form which proves fatal, when in the interval an operation might have been performed with less than 1 per cent. of risk in expert hands. Indeed, Richardson reported 500 such cases up to November, 1902, which all recovered,¹ and Deaver's latest statistics are equally good.

This is certainly a powerful argument in favor of having all such cases operated at a time, and under circumstances, which would be most favorable to success. While explaining that a prolonged medical treatment and strict diet promises to cure finally, I should always acquaint patients with the above remarkable figures, and as a rule advise the operation when the best conditions can be fulfilled. In the following instances, I think, the operation should be strongly urged: (1) in all subjects of the disease who have had at least one acute attack and in whom the catarrhal process is not steadily improving under appropriate treatment; (2) in all such persons who, by reason of their occupation, social position, or temperament, cannot be kept for months or, exceptionally possibly, for years under suitable treatment for the catarrhal condition. This treatment must include a more or less strict diet which many patients simply will not adhere to, and therefore, in their cases, as well as in the cases of those who have not the time nor money to devote to the tedious task of getting well by non-operative means, operation is clearly the preferable

¹ *Loc. cit.*

method. In those patients who have never had an acute attack, or only one very mild one, who will submit to a long medical treatment with a regulated diet, the operation can be safely dispensed with.

Under the head of Chronic Catarrh of the Intestines, I have described in Lecture LXVI. the dietetic, mechanical, and medicinal treatment which is indicated in chronic appendicitis whenever operative intervention is not invoked. Frequent counter-irritation over the diseased appendix should be especially insisted on. It should not be forgotten, also, that even when the appendix is removed, the associated catarrh in the cecum, as well as often in other parts of the colon, is not by any means always thereby cured, though it sometimes is. There remains the catarrhal state in the larger bowel with its injurious effect on the general health, and the same treatment which this then requires would, if skillfully and persistently carried out without the operation, often have cured the chronic appendicitis as well.

Report of Author's Case.—A report of my own experience with chronic appendicitis will help to illustrate the foregoing account of the disease. In the summer of 1900, when 58 years old, I took cold by bathing in a lake and afterward rowing in a wet bathing suit some distance to a bathhouse. There resulted a subacute colitis which only slowly yielded to treatment and left behind a slight constipation, with an occasional feeling of discomfort in the region of the cecum. After a time I was able to make out, by palpation, a marked sensitiveness and some thickening of the appendix. This condition was later confirmed by examinations made by my friends Drs. John B. Deaver, De Forest Willard, W. J. Hearn, and other expert surgeons of Philadelphia. I had been previously somewhat neurasthenic and found my nerve tone now distinctly more lowered. There was much intestinal flatulence and impaired sleep toward morning.

Early the following summer I took a long vacation, and returned much improved in health, but still with a slightly sore appendix. The treatment pursued consisted mainly of diet, systematic exercises, automassage of the abdomen, and elec-

tricity, the last taken very irregularly. A medical man makes a bad patient, especially when he is his own doctor. The summer of 1902 was spent in part in the Adirondack woods, where the coldness and dampness of an exceptionally cold, damp summer aggravated my intestinal trouble.

An autotoxæmic nephritis had meanwhile developed. Small amounts of albumen, with hyaline casts, were almost constantly demonstrable in the urine for the greater part of the time, for a year or longer. For this complication, after the failure of other means, I took the static wave current, as described in my recently published paper entitled *The Influence of the Secondary Static Currents in Removing Albumin and Casts from the Urine.*¹ This treatment, persisted in faithfully for several months continuously, not only did away with all the renal symptoms with the help of diet and a greater attention to physical exercise, but also seemed to assist much in relieving all the symptoms and signs referable to the appendix. As a result of all these means, my health greatly improved. During the past summer (1903) I stayed at home, attended to a larger practice than usual, and worked hard also in preparing the material for this book. I could no longer feel my appendix, had no pain or discomfort there, and believed it practically well. There is little room for doubt that had I continued my careful hygienic way of living, I should have had no more trouble from it, and that a lessening of confining work, with a persistence in treatment, would have effected a cure.

But, unfortunately for me, matters finally assumed such a shape that work on the book had to be pushed at a rate that left me no time for rest or exercise out of doors, and much overtaxed my energies. After several months of such unhygienic living, some grumblings began to recur in the cecal region, and finally I could again feel, at times, a slightly thickened and sensitive appendix. There was again a very abnormal amount of intestinal flatus, and much impairment of sleep.

A very slight attack of subacute catarrhal appendicitis then developed under peculiar circumstances.

November 29 some dull pain and tenderness on pressure, or on bending the body, were experienced in the right loin and side. At the same time a little twinge was occasionally felt

¹ *Am. Med.*, November 28, 1903.

in the region of the appendix, but the pain and discomfort were predominantly in the back and right side, just below the site of the kidney. Muscular rheumatism was at first suspected, and later the possibility of a large stone in the pelvis of the kidney trying to enter the ureter. On the morning of the 30th the discomfort in the whole right side and loin was marked, but the temperature reached only 99.8 at the highest, which was on the evening of that day, and there was no nausea, while the intestinal flatulence from which I had been suffering was almost entirely absent during the two days. In consequence, I enjoyed a greater feeling of well-being than before, and continued with my practice and writing as usual. On the morning of December 1 Dr. John B. Deaver examined me and found a subacute appendicitis—nothing else demonstrable—whereupon I decided to have the operation of appendectomy done at once, as the shorter and surer way to a complete cure, and the only way for one unable or unwilling to give up hard work and carry out strictly the necessary line of medical treatment.

My improved feeling of well-being, in spite of a congested appendix, was probably because its outlet had swollen shut and there was no more leakage of septic matter from it.

The operation was done December 2, at the Samaritan Hospital, by Dr. Deaver, assisted by Dr. W. Wayne Babcock, surgeon to the hospital, and the resident staff of that institution. The appendix was found swollen to nearly double the normal thickness, considerably infiltrated, and the vessels much injected. The mucosa presented the usual signs of catarrhal inflammation, and there was a slight narrowing of the lumen at the cecal end.

My convalescence was uneventful. On the fifth day the stitches were removed by Dr. Babcock, and on the beginning of the eleventh day I was able to leave the hospital.

A thorough examination of my urine, made shortly after the operation, revealed no trace of either albumin or casts.

Further Considerations Regarding the Management of Appendicitis.—In few fields have the triumphs of surgery been more notable than in that of the appendix. Unlike the ovary or kidney, it is not only neither a vital nor even a useful organ, but is a positively dangerous one, or at least one likely

to become a source of danger at any time. Any patient is always better without it, and some have even gone so far as to advise its removal in every infant, as the only sure prophylaxis against appendicitis, just as we vaccinate against smallpox.

But for the considerable inconvenience and at least slight risk of the operation, most persons would have it removed while well. When the organ becomes diseased in whatsoever degree or form, the reasons for wishing to be rid of it altogether are greatly increased.

Supposing a patient attacked with acute appendicitis to be so situated or so constituted temperamentally that he would prefer the operation of appendectomy, done under the best possible conditions, to the risks of future acute attacks, or the tediousness and expense of a prolonged medical campaign against the chronic disease which usually follows, the practical question arises, How can he most safely effect his purpose? If the attack has come while he is in any of the larger cities, he will be reasonably sure of a prompt diagnosis, and could have an early operation done with such skill and care as to involve not very much more risk than attends what is called the interval operation, for which the time, place, and surgeon can all be carefully chosen beforehand.

Unfavorable Conditions for Operation.—But suppose, instead, he is on a sea voyage, a gunning trip, or camping in the woods hundreds of miles from any town, when the acute attack comes? Or for that matter, suppose it finds him in some remote country village, where the only medical man obtainable may have never even seen a laparotomy. Then the only alternative would be to call the nearest abdominal surgeon, who would most frequently arrive late, and have to do the always dangerous late operation with probably much less skill than that of a Deaver or Richardson, and might possibly be a bungler with a very faulty technique, and unable to afford him as much hope of recovery as he would have under the most ordinary medical treatment.

On the other hand, it is claimed that under the rest and starvation treatment of acute appendicitis vigorously adhered to from the beginning, even the gravest cases may usually be carried through to an interval when an operation, which would be practically devoid of risk, could be done by almost any fairly competent surgeon, though there would then be opportunity for the selection of a convenient time, a suitable place, and an expert laparotomist, if desired.

Under these circumstances it seems to me the very height of unwisdom to teach general practitioners and the laity that an operation is the only remedy in acute appendicitis. Such a doctrine, if fully accepted, means that any half-trained surgeon, no matter how clumsy, inexperienced, or dirty, should be permitted in an emergency to open the belly of an appendicitis patient.

Even if Ochsner and his starvation-anticathartic method, with its extraordinarily small death rate, had never been heard of, it would still be safer not to operate, except under reasonably favorable conditions, since the old Alonzo Clark method of treating attacks of so-called local peritonitis, which were really in most cases appendicitis, saved a very large majority of cases—doubtless, too, because it prevented peristalsis and the spread of the infection.

Then, let me again urge upon you that you adopt the safe rule of withholding food and cathartics in all doubtful attacks, beginning with fever and pain in the abdomen anywhere, until you can exclude the possibility of appendicitis. When the suspicion of this affection is strong, and especially if there be nausea, or any symptom of a laboring stomach, wash the latter out, so as to begin the fight without any handicap upon the patient.

If, then, the disease proves to be something else, no harm will have been done, but, on the contrary, good. Virtually, all the forms of disease with which appendicitis is likely to be confounded will be the better for such a conservative beginning of the treatment.

After this good start, if you find a severe type of appendicitis to be developing, call a consultation, including always as one consultant the best obtainable abdominal surgeon, and whatever may be subsequently done, you will have nothing to regret.

LECTURE LXIX

CONSTIPATION

CONSTIPATION may best be defined as an imperfect emptying of the bowels. It is a morbid condition which may result from many different diseases. Though only a symptom of some pathologic state, either in the innervation or muscular apparatus of the intestines, or of disease elsewhere in the body, it is exceedingly prevalent in civilized communities, and in its chronic form is almost never cured by the administration of medicines alone, nor by any directly opening measures, whether in the form of laxative drugs, per os or per rectum, or by colon douches, or even the usual routine massage.

Ætiology.—To enumerate all the diseases which seem often to stand in a causal relation to constipation would almost exhaust the list of important known maladies. Prominent among those which nearly always produce constipation (and many of them complete obstruction) are meningitis, brain tumors, among other cerebral and spinal affections, lead poisoning, volvulus, invagination of the intestines, hernia, peritonitis, appendicitis, abdominal and pelvic tumors, etc. Tumors, however, sometimes cause diarrhea. Constipation may also be a result of blood impoverishment, and of most depressing diseases of the nervous system, inflammation of the stomach or upper intestines, ulcer or tumor of the same, and stricture of the bowel; also, of abnormalities in the gastric secretion, especially hyperchlorhydria, many diseases of the liver and pancreas, and particularly of the downward displacements (ptoses) of the abdominal viscera, as well as backward displacement of the uterus and other diseases of the pelvic organs. Prolapse of the right kidney (movable kidney), which is exceedingly common in

women, is often a factor in the production of constipation by obstructing at times the lumen of the duodenum, and the agglutination of folds of intestine to each other or to neighboring structures may seriously impede the onward propulsion of the feces. (See Lecture LXIV.)

The most prolific causes of chronic habitual constipation, and those most amenable to non-operative treatment, are to be found in either one of two opposite conditions involving both the nervous and the muscular apparatus of the gastro-intestinal tract, and requiring quite different methods of treatment. These are atony and spasm. Atony of the stomach walls, whether amounting to dilatation or only to motor insufficiency with delayed emptying, results generally in a deranged intestinal peristalsis showing itself usually, at first, in the form of constipation. Atony in any part of the intestine must manifestly produce a like result.

A spastic state of the pylorus or of the muscles of the intestines, leading to irregular local tonic contractions of the circular fibers, is a common and often unrecognized cause of constipation. In hysteria, and in certain forms of neurasthenia, such localized spasms are perhaps almost as frequently responsible for difficult defecation as muscular atony, and much more frequently than any other single cause. It is probable, also, that the deranged digestion, both gastric and intestinal, which so often accompanies neurasthenia, by producing fermentation and abnormally acid conditions in the alimentary canal, conduces powerfully to the spasmodic action; and it is likely that portions of the bowel, the mucous membrane of which is in a state of chronic catarrhal inflammation, have an increased tendency to spastic contractions.

Authorities differ widely as to the relative importance of various factors in the causation of both atonic and spastic constipation. Glénard considered displacements of the stomach and intestines as chiefly responsible, while Emminghaus traces habitual constipation to degenerative changes in the splanchnics, and Dunin thinks it attributable mainly to central

functional anomalies in the nervous system. Boas¹ finds it difficult either to deny or confirm these theories; but points out that in any fully developed case of neurasthenia with constipation there may be found a vicious circle, and he thus aptly illustrates his idea by describing a supposed case such as we all often see:

"A previously healthy woman begins to suffer with constipation and requires aperients. Gradually these become inefficient; defecation is more and more difficult and imperfect. At the same time, there is taken a decreased amount of nourishment, either in consequence of a misuse of purgatives, or as a therapeutic measure ('easily digestible food'), or as a result of a bad general condition, or from anæmia or gastric derangements, *e. g.*, atony. Naturally, then, follow emaciation, dropping of the abdominal viscera, and, with these, increase of the constipation, and finally, as a capstone to all these symptoms, the picture of well-marked neurasthenia. Here, as every experienced physician must concede, the enteroptosis is not the cause, but the consequence, of the habitual constipation, and the same holds good also for the neurasthenia. But, on the other hand, the loss of flesh from whatever cause can lead to the development of visceral displacements, and so produce constipation, or, perhaps more correctly, favor its development, as also, in like manner, genuine neurasthenia (according to Dunin's view) may prove the basis for the development often of even very stubborn forms of constipation."

An insufficient amount of food or drink, a too bland diet lacking in refuse matters, or a too predominantly nitrogenous diet, sedentary occupations, deficient exercise, and a want of regularity in going to stool are further important causes of chronic atonic constipation.

Symptomatology.—It has been denied that auto-intoxication can be caused by dry feces, no matter how long retained, and in Germany the resulting phenomena are more generally considered to be reflex; but, however accounted for, some of

¹ "Diagnostik u. Therapie der Darmkrankheiten," Leipzig, 1899.

the following symptoms may be constantly observed as a result of constipation: Dizziness, headache, insomnia, mental hebetude or depression. Other frequent symptoms, which usually disappear more or less quickly after overcoming the constipation, are nausea, furred tongue, offensive breath, excessive flatulency, colics, failing appetite, as well as other indications of impaired digestion, urticaria, and various other affections of the skin, and objectively ascertained, often deranged gastric secretion (especially excessive HCl) and probably lowered gastric motility, as well as indicanuria and excess of the aromatic sulphates, and of the total acids in the urine. Other objective signs are dry, hard stools, lumpy or made up of agglutinated balls of different color and consistency, or hard globular feces of various sizes, from that of hazelnuts up, or in spastic cases, as well as in cases of organic stricture, unusually small cylinders like lead-pencils.

Periodic transient attacks of diarrhea, with usually mingled lumps and liquid feces, which are often exceedingly offensive, may be considered as a symptom of chronic constipation. In these cases there is irritation of both the mucous membrane and musculature of the intestines by the long-continued pressure of the hard fecal masses and distention from the imprisoned gases, and probably a catarrhal process is also set up in places, through infection from the enormously multiplied bacteria in the stagnant feces, with abundant formation of organic acids from fermentation.

It is a serious mistake to treat such diarrheal attacks by opiates and astringents, or even by antiseptics alone, when nature has so clearly pointed the way to a prompt clearing out of the intestines. Recurrent diarrheas, with either no stools or insufficient stools between, are signs of chronic atonic constipation, or else of a mild chronic enteritis, and need to be treated accordingly.

The Differential Diagnosis between Atonic and Spastic Constipation.—It will be of chief practical importance to differentiate the atonic and spastic forms of constipation from

each other, and both of these from the organic changes which may impede defecation. Westphalen¹ of St. Petersburg has written elaborate papers concerning both the atonic and spastic forms of constipation, and has pointed out the differences between the two very clearly. Numerous authors, including Nothnagel, Boas, Flick, Fleiner, and others, in Germany especially, have mentioned the spastic as a possible form of constipation, but with a few exceptions do not lay much stress upon it. Many cases of this affection, which were seen in my own earlier practice, were not recognized as such. They were often given abdominal massage, not only without benefit, but with the result of increasing the constipation. These were patients suffering from neurasthenia in connection with gastrointestinal derangements, and many of them showed spastically contracted abdominal muscles and excessive knee jerks. I do not now prescribe the usual vigorous abdominal massage for such patients, though I sometimes find them to be benefited by light stroking—effleurage; but try to cure them by general roborant measures, trusting to diet, special exercises, oil enemas, etc., to keep their bowels open. Besides the fact that spastic constipation occurs in nervous, excitable patients with heightened reflexes, Westphalen points out that in such cases the stools, though usually complete, are passed with the greatest difficulty, and often only after much straining and long delay. Afterward there is left behind an unsatisfactory feeling, as though the rectum had not been perfectly emptied, even when an examination would show that no feces remained there. This sensation he considers to be due to an irritated condition of the nerve-endings in the rectum. A like hyperæsthesia of the mucous membrane of the bowel is supposed to play a part in producing the irregular contractions of the circular muscles which hinder the onward progress of the feces. A contrary group of symptoms obtains in uncomplicated atonic constipation. Here the amount of feces passed daily is too

¹ *Archiv f. Verdauungskrankheiten*, vol. vi., No. 2, and vol. vii., Nos. 1 and 2.

small, not at all in proportion to the quantity of food taken, and yet the patient may pass them with little straining or effort and feel afterward as though he had had a thorough evacuation. He may also be neurasthenic, but will not likely have such exaggerated reflexes. His abdominal muscles will not be so rigid upon palpation, and a finger introduced into the rectum will not be so tightly grasped.

The Stools in Atonic and Spastic Constipation.—With regard to the appearance of the stools in the two forms, all agree that slender ones of lead-pencil or little-finger size, whether long or short, mean a spastic contraction of some portion of the bowel, when an organic stricture can be excluded, except in cases of semi-starvation, especially in cancer, as a result of which the lumen of the intestine may become greatly lessened. These slender stools may be canaliculated. I may add, as an important diagnostic point observed by myself, that spastic conditions are almost never constant, but the patients will at some time, under favorable conditions, however induced (often as a result of nerve sedatives), pass stools of normal caliber, whereas, when there is a permanent stricture, the stools are always in either a slender form or fluid. Westphalen also lays some stress upon the consistency of the stools, insisting that, while they are very hard and dry, and often covered with a thin layer of mucus in the atonic form, those passed in the spastic form contain no mucus outside or inside, but have usually a larger percentage of water, and are tougher, more sticky, and of a more glistening appearance—*glänzend*. The latter also contain less gas, so that they will not float in water, as normal feces or those from a case of atonic constipation usually will.

Careful palpation and percussion over the abdomen will show differences between the atonic and spastic types of constipation. In the former, a more general tympany should be demonstrable, with possibly masses of hard feces to be felt in the cecum or flexures of the colon; while, in the latter type, one may often feel portions of the intestine contracted like a cord

under the finger. Then, in the spastic form, too, there are more frequently very sensitive spots in various part of the abdomen, especially in the region of the umbilicus, and there are portions over which marked tympany contrasts sharply with the duller note of adjoining regions, showing imprisoned gas. Tabetic patients in an early stage are likely to present the phenomena of spastic constipation. Judging from my observation, it is highly probable that most neurasthenic patients who suffer excessively from intestinal flatulence which accumulates in places to their great discomfort, finally passing with borborygmi through evidently narrowed coils of intestine, while the feces themselves are retained, have the spastic form of constipation, however complicated with other conditions. Finally, you may find both forms in the same case, since it is quite possible for atonic constipation to be complicated at times by a spastic condition.

Constipation from Strictures or Other Organic Obstructions.—From the constipation or obstruction dependent upon serious organic disease, such as strictures, tumors, inflammatory affections, etc., both the atonic and spastic form of impeded defecation can generally be differentiated by thorough and painstaking examinations, with the help of our modern exact methods. Other serious conditions which must be differentiated from the simpler forms of constipation are adhesions of intestinal loops to each other or to adjacent structures following operations or peritonitis, partial twists of the bowel (volvulus), and chronic forms of intussusception. Some of these it is impossible at times to diagnosticate, except by exclusion, but intussusception in a chronic form should be suspected whenever there are recurrent colics accompanied by the passage of a little blood or mucus or both.

The above-mentioned hint as to the constant smallness of the stools in organic stricture should be helpful in making a diagnosis. Filling the stomach with gas, and again with liquid, and afterward, if necessary, treating the colon in the same way, will often reveal latent tumors and their attachment, and

a thorough douching of the colon with warm water will usually demonstrate a chronic enteritis by the amount of mucus brought away. You should be careful not to mistake for morbid growths the masses of hardened feces which can often be felt in chronic constipation, especially in the cecum, flexures of the colon, sigmoid, and rectum. Indeed, before making a final diagnosis in any case of suspected abdominal tumors, the bowels should be thoroughly emptied by repeated enemas of oil, followed, if necessary, by flushing the colon with a warm saline solution after the administration of a full dose of belladonna or atropine to relax any spasmodic contractions.

The importance of taking the necessary pains to reach a definite diagnosis in these cases cannot be overestimated. The time has gone by when we should be content to let our constipated patients continue indefinitely with whatever laxative drug affords them the most comfortable evacuations. Our duty is to ascertain the exact cause of the constipation, and then to cure it, as is possible in a large majority of cases.

LECTURE LXX

CONSTIPATION, CONTINUED—PROGNOSIS AND TREATMENT

CONSTIPATION is curable when its cause can be cured or removed. If the cause be some functional nervous affection, a displacement of the stomach or liver, chronic catarrh of the stomach or small intestine, excessively acid or deficient gastric juice, gastric or intestinal atony, or spastic contractions of the pylorus or of parts of the intestines, the condition is generally remediable by some one or more of the hygienic, hydriatic, mechanical, and medical measures which we have at command. Even gastric ulcer, movable kidneys, and displacements or kinks of the intestines, you may often be able to overcome by a combination of several of these non-surgical measures, and thus cure the resulting constipation.

Serious cases of obstruction, whether due to any of the above-mentioned causes or to hernia, volvulus, adhesions from former attacks of appendicitis, or from local peritonitis elsewhere, usually respond to surgical intervention when invoked sufficiently early, now that abdominal surgery has become so wonderfully developed and perfected. When a tumor interferes with defecation, the prognosis depends upon its character, location, and size, and the ability of the patient to bear the necessary operation. The chronic organic diseases of the nerve centres being generally incurable, the prognosis of the constipation dependent upon them is necessarily bad. Most pelvic causes of constipation can be remedied in some way nowadays, except malignant growths, and even these will sometimes yield to prompt surgery or the Massey method—possibly even to the x-rays or radium.

Treatment.—Chronic habitual constipation, resulting from any of the above-mentioned diseases, can only be overcome, of course, by a successful treatment of such diseases. Many of these have already been discussed in previous lectures, and others will be later.

It remains to consider especially the two principal types of constipation, the atonic and the spastic. These are not only the types most frequently encountered, but, though generally secondary to other affections, they both depend much more than other forms of constipation upon a diseased condition in the nerve supply or muscular apparatus of the intestines themselves. This is particularly true of the atonic form. Impaired gastric motility or a faulty secretion on the part of the liver, peptic or pancreatic glands, or a weak, depressed nervous system, as well as numerous other maladies, often conduces greatly to this type of constipation, and there is perhaps always some such predisposing factor in the causation. Yet a sedentary life, with lack of exercise leading to lowered vigor of the intestinal muscles, abuse of purgatives (one of the crying evils of the times for which we doctors are, I fear, in large part responsible), and also a too concentrated diet, are all causes which may set up atonic constipation by a direct action upon the intestines themselves.

To cure this condition, you will need, therefore, to impress upon your patients, first of all, that even the mildest laxative drugs must be abandoned, or taken only in the smallest possible effective doses when, and so long as, they are indispensable, which they rarely are; that exercise, especially of the trunk muscles, must be practiced every day to the end that both these and the muscles involved in the peristalsis may be gradually strengthened up to the normal—a process which may require many months to accomplish—and you must strenuously insist also upon such a modification of the diet as shall afford refuse matter enough in bulk to effect the necessary distention and stimulation of the intestines.

Of course you will see numerous patients in whom all this

cannot be easily done. There are many cases of constipation complicated with, or even dependent upon, catarrh of the stomach or small intestine, and sometimes the process involves isolated patches of the colon. In these, before you can cure the constipation, you must first get rid of the catarrhal process by the help of an unirritating and often somewhat constipating diet, meanwhile securing sufficient bowel evacuations by the least disturbing methods that will effect the object. This will rarely be pills or any of the resinous laxatives in any form. Olive oil by the mouth, with plenty of drinking water, will sometimes suffice. Enemas of olive oil or cotton-seed oil, or, in some cases, of a tepid or cold saline solution, will usually prove less irritating than any aperients by the mouth, and the former will seldom fail when skillfully used. In all cases, when not otherwise contra-indicated, the special exercises for the abdominal muscles described in Lecture XXIII. should be practiced daily in a well-ventilated room. Massage of the abdomen will assist in curing the catarrhal process as well as in directly overcoming the constipation, except when there is a spastic complication. The constant electric current (galvanism) applied to the abdomen and lower spine, and often the interrupted current (faradism), static-wave or static-induced current or vibratory stimulation within the rectum will prove very helpful in stubborn cases. In the catarrhal conditions, whether they are primarily causative or only complications, actual curative results may often be obtained from small doses of the saline laxatives, such as the natural Carlsbad (Sprudel) water, the Rubinat Condal water, or artificial solutions of sodium sulphate or phosphate, and sometimes the bitter waters (magnesium sulphate natural waters or solutions), and in cases not too depressed or debilitated you will be justified in making a trial of them for the double purpose of helping to remove the catarrhal process, thus obviating one chief obstacle to the cure of the constipation, and keeping the bowels open meanwhile. In the more asthenic cases, however, especially those with deficient gastric secretion, the alkaline waters and drugs will

be likely to disagree and the more tonic sodium chloride waters, such as those of Kissingen and Homburg, will then agree better.

In any case when one or, at the most, two teaspoonfuls of Carlsbad salt or of sodium sulphate, or an equivalent dose of the natural waters, fails to keep the bowels open with the hygienic and mechanical helps mentioned, it will not be desirable to administer large doses of them for long periods, even in the presence of catarrhal complications. You should, then, instead, continue them in the same small dose, provided they agree (not producing irritation); and as auxiliaries, besides plenty of drinking water, give the oil or saline enemas already mentioned. Then, if need be, give one of the forms of local stimulation above referred to, of which the simplest is faradic electricity with one pole in the rectum, the other to be moved alternately over the lower spine and over the course of the colon in front.

The milder the case of an associated chronic intestinal catarrh, the more nearly the treatment may approach to that required for simple atonic constipation, from which it doubtless may sometimes result; but in the pronounced cases, the diet must be blander and more concentrated, including much more lean beef and avoiding all coarse, irritating articles.

For further details as to the diet and other treatment appropriate to catarrhs of the alimentary canal, see the previous lectures devoted to those diseases.

Do not overlook the fact, in prescribing remedies for one part of the alimentary canal, that they may act injuriously upon another part. For example, such drugs as belladonna and Carlsbad salts, as well as some of the foods, such as sugar and the fats or oils, which are useful for their laxative effect (not to mention the value of Carlsbad water or salt also for their alterative effect in catarrhal affections), have a very positively depressing effect upon gastric secretion, lessening the quantity and strength of the gastric juice. These effects have been confirmed repeatedly. In fact, any physician who does not

test the stomachs of his chronic invalid patients occasionally, as to their secretory work, should avoid drugs as much as possible and depend mainly upon hygienic measures. Even then his dietetic prescriptions may often disagree with the stomach in a way that could have been foreseen and prevented.

In cases of atonic constipation without any inflammatory complication, or after curing a previously existing catarrh, you should usually devote your first and your chief attention to the diet, reducing the excess of meat and other nitrogenous foods which most constipated persons allow themselves, or have had prescribed for them. This nitrogenous overplus does harm in various ways when long continued, but what concerns the present discussion mainly is that, when taken in the form of meat or eggs, as is usually the case, it does not leave enough residue in the intestines to afford the necessary distention and mechanical stimulation to provoke an adequate peristalsis. A considerable proportion of cellulose, found largely in the grains or their coarser preparations, vegetables, and in many fruits, is absolutely necessary to induce regular and complete evacuations of the bowels, unless one is to depend upon physic. These bulkier foods all contain, of course, much starch combined with more or less sugar and some proteids, but physiology teaches us that about three-fifths of our nutriment needs to consist of the carbohydrates—starch and sugar—and the other two-fifths should be made up of proteids (nitrogen) and fats (hydrocarbons).

Penzoldt's Diet for Atonic Constipation.—The subjoined diet table for uncomplicated atonic constipation was originally prescribed by Penzoldt and is also recommended by Boas:

7 A. M.—One glass of water.

8 A. M.—A generous breakfast with sweetened coffee, much butter, honey and Graham bread or brown bread (pumpernickel). Thereafter an attempt to have a stool.

1 P. M.—Dinner of meat, much vegetables, salads, stewed fruit (compot), farinaceous preparations (mehlspeise), one-half bottle of light wine—Moselle—or cider.

7 P. M.—Meat with much butter, Graham bread, stewed fruit, and beer.

10 P. M.—Before going to sleep, fresh or stewed fruit.

The alcoholic beverages included in the above list are not indispensable, since an equivalent amount of fruit juice would be equally effective in promoting bowel movements. You should also bear in mind that in numerous diseases which are often associated with constipation both the decidedly sweet and sour articles of such a typical laxative diet, as well as the excessive amount of indigestible material in the form of cellulose as in many of the vegetables and raw fruits, are likely to aggravate and are, therefore, positively contra-indicated. Boas calls attention to this himself and mentions among the diseases in which such a diet is contra-indicated the following: diabetes mellitus, obesity, atony or dilatation of the stomach, hyperacidity, gastric ulcer, cancer of the stomach or intestines, and excessive flatulence. My own experience fully bears out the statement of Boas as to the unsuitableness of the diet scheme above given in the presence of the diseases just named as well as in pronounced catarrhal inflammation of any part of the alimentary canal and in ulceration of the intestines.

The ultra adherents of the meat-and-hot-water regimen, which often proves efficient during short periods in the treatment of chronic catarrhal inflammations of the alimentary canal, have preached constantly against starch and led thus to a popularization of the foolish notion that starchy foods are to be carefully avoided in all the derangements of the digestive system. On the contrary, except in the catarrhal cases (when for a few weeks at a time the starches and sugar may be greatly restricted), there are few such derangements in which a mixed diet, with a due proportion of the carbohydrates, is not preferable in the long run. It is necessary, as not only promoting more thorough elimination through the bowels, but also as better supplying the needs of nutrition. When not otherwise contra-indicated or found to disagree, the fats in the form of

fresh cream, butter or olive oil, and also sugar, especially sugar of milk, if taken rather liberally by constipated persons, will greatly conduce to freer stools. Many patients can drink coffee with apparent impunity, and it often exerts a slight laxative effect. Tea, chocolate, cocoa and milk, and claret tend to increase constipation, as a rule, to which there are occasional exceptions. Cold water, taken one or two tumblerfuls several times a day—upon arising, at bedtime, and between meals—often helps to overcome atonic constipation. The addition of five to ten grains of table salt to each tumblerful of water increases its efficacy, except in hyperchlorhydria, when soda or some other alkali should replace the salt.

Next in importance after the diet comes exercise in the open air. Patients who have been stubbornly constipated while leading sedentary lives, often recover spontaneously after engaging in outdoor occupations, or through spending several hours daily in such recreations as horseback riding, rowing, golfing, or lawn-tennis, though, prolonged and excessive horseback-riding, as in the case of cavalrymen, has been observed to produce constipation. Bicycling sometimes effects a cure, but less frequently.

Changes of climate involving, as they usually do, rest from mental or nervous strain, and especially when prudent sea-bathing or mountain climbing is added, often promptly relieve constipation. When these things are not practicable, good results may usually be obtained from systematic movements of the trunk muscles and a course of hydriatic treatment carefully adapted to the case. Reference has already been made to the *exercises* that may be practiced by patients in a well-ventilated bedroom; and the douches or *sponge baths* with tepid or cold water, that may be taken in any bathroom, will frequently prove effective in connection with appropriate diet. Cold affusions or douches do not suit well in the spastic cases; and the same may be said of *abdominal massage*, which, though it aggravates the spastic form, may be a very useful factor in the treatment of atonic constipation, given by the physician him-

self (when he is competent to give it), or by a thoroughly expert masseur under his personal supervision.

But massage of the abdomen, like gymnastics, can only very gradually overcome even atonic constipation by developing and strengthening the muscles involved in the act of defecation. Except, therefore, in the case in which the diet, with a liberal use of drinking water, effects a speedy improvement, this form of constipation requires time to cure—nearly always months and sometimes a year or more. For the small proportion of incurable cases of constipation in which enemas of oil do not procure sufficient evacuations, the best laxative drugs are cascara, aloes, senna, and sulphur, in their smallest efficient doses.

The treatment of the *spastic form* resolves itself mainly into the cure of the neurasthenia or hysteria upon which it depends. When this is severe in type, the usual method by rest, seclusion, and generous feeding is applicable, except that massage of the abdomen must be omitted, and that the milk diet disagrees when there is much dilatation or even marked atony of the stomach.

For the milder cases in which the constipation and an irritable nervous state are the main symptoms, less radical measures will usually prove effective. Notwithstanding the excessive irritability of the intestines, a bulky diet, including a liberal allowance of vegetables and fruit, is usually helpful here as in the atonic form, when not otherwise contra-indicated. Not only is massage of the abdomen to be avoided in the spastic type, but stimulating affusions or jet douches of cold water to the same part are likely to aggravate, and our German confrères generally insist that purgatives are equally harmful. My own experience confirms all these observations. Good results may be expected from the usual building-up measures, including systematic exercises and tonics, except that possibly iron may increase the constipation, and even strychnine and the other tetanizers may have a like effect in this form unless given in small doses. Warm jet douches to the abdomen

are recommended by Westphalen, who also insists that opium and belladonna in these cases will often produce more copious evacuations than purgatives. The same author advises bromides, with small doses of chloral, for more prolonged use, to overcome the irregular intestinal contractions. With regard to belladonna and atropine, there are numerous observations attesting their efficacy in various forms of constipation, and even in obstruction from irregular spasmodic muscular action, intestinal cramps of different degrees of severity; but it needs to be constantly borne in mind that in overcoming by these remedies a spastic constipation associated with hypopepsia—dyspepsia from deficient gastric juice—the latter condition will necessarily suffer an aggravation that may be serious, though this result might be avoided by administering HCl and pepsin after meals at the same time. In cases of spastic constipation with persistently excessive contraction of the anal sphincter, the latter should be dilated either quickly under anæsthesia, or gradually by dilators.

Olive oil, both by the mouth and by enema (especially the latter), is a safe and generally efficient resource in stubborn cases of the spastic form. I have recently seen curative results in cases of constipation from the use of various preparations made from coal oil such as vaselin, albolene, Purpetrol given internally. Teaspoonful to tablespoonful doses of either, taken once or twice a day, often succeed in mild cases; but these petroleum preparations seem to depress the heart a little in some cases when used long, and even Purpetrol, the purest of them all, will bear watching.

In the spastic, even more than in the atonic, form of constipation, the greatest help may be derived from changes of climate and an out-of-door life, except in the case of the worst neurasthenics and hysterics, who require rest at first. Then, as in all nervous affections, every case needs to be studied by itself. There is no class of diseases in which routine methods are more likely to fail.

The best progress will be made when the state of the gastric

function, both secretory and motor, is carefully studied. The cases with markedly deficient peptonization will often gain as much by the administration of HCl and pepsin after meals as the opposite class of cases are sure to be injured and aggravated by such a line of medication.

Great regularity in observing fixed times for eating and for defecation is extremely important. Various observers have noted the clinical fact that lavage will sometimes cure constipation. Spivak has recently called attention anew to this and claims priority for the original observation. He has found lavage useful (1) in constipation due to excessive acidity; (2) in the same due to gastric atony; (3) in diarrhea from excessive mucus in the stomach, and (4) in obstruction of the intestines, from whatever cause. I have employed lavage coincidentally with other measures in a great many cases of constipation from various causes, and have occasionally seen the latter symptom relieved by it.

Flushing the colon with large quantities of water or aqueous solutions of drugs may be useful for short periods, but as a means of emptying the bowels regularly in stubborn cases of chronic constipation, which has proved refractory to curative treatment, is to be condemned. It is sure in time to aggravate the disease, causing a gradually increasing paresis and dilatation of the colon.

LECTURE LXXI

DIARRHEA

Ætiology.—The symptom diarrhea is most frequently a consequence of catarrhal inflammation of the mucosa in some portion of the bowel, but may result from constipation both through the direct irritation of the mucous and the muscular coats of the intestines by the retained and hardened fecal masses, and by the irritating influence upon the same of the gases which are caused by decomposition in such feces. Diarrheas thus produced soon develop into true inflammation—enteritis—after frequent recurrences, especially when neglected, or repeated, as so often happens, by astringents and opiates. Frequent loose stools may also depend upon poisons, etc., in the blood, as in uræmia, lithæmia, malaria, and various acute diseases. They often owe their origin to fermentation in the stomach in consequence of the absence or deficiency of HCl, as in chronic gastritis, especially the atrophic form with achylia, and of the digestive ferments in the gastric juice. They occur usually in the later stages of morbid growths in or adjacent to the intestines, though sometimes in these cases constipation persists almost to the end. Diarrhea occasionally seems to have no other cause than a nervous derangement involving the peristaltic apparatus. The feces are then propelled so rapidly that they do not have time to harden by the absorption of their liquid contents. The loose movements may also depend upon either an increased secretion or diminished power of absorption, both of which conditions may result from faulty innervation as well as from other causes. Diarrhea is an almost constant accompaniment of tuberculous, syphilitic, and

simple ulceration of the bowels, especially when the colon is affected.

Chronic catarrhal inflammation involving the appendix alone, or with only a slight and occasional implication of other portions of the gut, is probably responsible for many otherwise inexplicable recurrent attacks of bowel looseness. I have often observed such attacks in persons presenting signs of a thickened and somewhat tender appendix, but without evidences, in the intervals, of enteritis elsewhere, and sometimes no such evidences appeared even during the attacks; and the latter could not be traced to any of the ordinary causes.

It is well known that bacteria grown in closed cavities are likely to be excessively virulent, and it is probable that the colon bacilli, which are from time to time forcibly expelled into the cecum through the stenosed orifice of a catarrhal appendix, may be virulent enough to set up a decided irritation of the colon with or without the production of a catarrhal process there.

Chronic enteritis, involving a portion at least of the colon, and often much of the small intestine as well, is, however, with sometimes ulceration as a complication, the most frequent cause of a persistent diarrhea. When enteritis exists, you will be able to find at times mucus in the stools, either coating the occasional formed portions on the outside, showing its origin low down in the colon or rectum, or more commonly mixed with the feces more or less intimately, coming then from higher up in the bowel. Usually, too, by deep palpation gently made, you will find sensitive regions over the course of the colon, especially over the transverse portion and the cecum.

The treatment of diarrhea divides itself naturally into dietetic, mechanical, and medicinal, and the medicines useful in the disease include eliminants, alkalies, and antiseptics, with sometimes sedatives and astringents.

In an acute attack of loose bowels, or one which has existed only a few days, it is usually not necessary to do anything ex-

cept to insist upon rest, and either abstinence from food or a limitation to the smallest quantities of the blandest possible nourishment, such as fresh meat juice or boiled milk with boiled rice, though the remedies to be first administered in a doubtful chronic case, as recommended below, will often hasten the cure.

To give you the most practical instruction in the clearest manner, I will advise you how one may best proceed in a case of diarrhea which has persisted a number of days, or weeks, or longer, in a patient not tuberculous nor syphilitic, not acutely ill in any way, and not having a palpable tumor in the abdomen. If the stools are very offensive (or if they contain scybala, with or without mucus), begin with a moderate or small dose of some gently acting laxative, preferably a teaspoonful to a tablespoonful of castor oil, but an equivalent dose of rhubarb or a saline will answer the purpose. When the tongue is foul and the breath bad, follow with grain 1-20 to 1-6 of calomel, given every hour or two till the stools become less offensive and of a yellow color. If there should be nausea or an irritable stomach, it would be better to omit the oil and begin at once with the smallest mentioned doses of calomel, given every hour at first, and later every two or three hours. This is usually the better plan, in the case of children especially. These will, in a few days, often control both the gastric and intestinal trouble without any other measures except rest and diet, as advised above for an acute or recent attack.

Should the laxatives not have removed all fetor, scybala, and undigested pieces of food from the stools by the end of two days, it will usually be desirable to give oil or rhubarb a second time, unless there should be pain or other signs of irritation produced by the remedies, which rarely happens, except when excessive doses have been administered. In the event of such irritation, give, instead of more laxatives, 5- to 20-grain doses of bismuth subnitrate after every loose stool; and a day or two later, if all the symptoms have not been

removed, repeat the laxative and continue cautiously this method of elimination with the addition of bismuth after stools, and opium if needed for severe pain, until by careful inspection of the evacuations and deep palpation over the colon, you have determined that all stagnant and decomposing remains of food or feces have been removed.

In the great majority of cases, including usually all those dependent upon an underlying condition of constipation, which has led to accumulations of hardened feces, with often patches of inflammation of the mucosa, such a course of laxatives continued for a few days with a little bismuth at the last, combined with chalk when the stools are very acid, will, without any opium or active astringent, be found to have controlled the diarrhea. You will need then to apply yourselves to the more difficult task of overcoming the underlying condition of constipation, for which, besides diet and special exercises, massage and electricity will serve you best, as I have described in Lecture LXX. The cases in which constipation has gone on to the development of a persistent diarrhea, will usually present more or less intestinal catarrh, and both the constipation and its resultant diarrhea will then be best treated by remedies addressed to the pathologic change.

In certain cases the bowels can be emptied better by a thorough flushing of the colon from below than by purgatives, and, generally speaking, the more strictly the disease is limited to the large intestine, and the longer the accumulation of feces has been going on, the greater the advantages of this method of removing the cause, provided it be not continued too long.

Complicating Conditions.—But in a certain proportion of these cases, even after the intestines have been cleared of fecal masses, decomposing ingesta, irritating secretions, etc., frequent thin stools will persist. In such cases, you should test the stomach contents to see whether the gastric juice is sufficiently active, and proceed to remedy any deficiency discovered. You should also study the urine carefully, to determine

whether the uratic diathesis or some other toxæmic state is not answerable for the persistent flux. You may find that a latent nephritis is at the bottom of the trouble, the kidneys failing to do their excretory work thoroughly, thus imposing more upon the bowels; and in all these self-poisoning cases you will readily see what mischief must be wrought by the customary method (which fortunately generally fails) of trying to check diarrhea with opium and astringents.

The Appendix Often Involved in Diarrhea.—You will also examine thoroughly to see that there is not a tender, swollen appendix sending out its colonies of virulent colon bacilli, or a cirrhotic liver, or feeble, laboring heart causing an obstructed circulation in the abdominal vessels, or that widely prevalent affection in women especially, a downward displacement of one or more of the abdominal viscera, which has been the disturbing cause, producing at first, as such conditions usually do, constipation, followed by its very frequent sequel—diarrhea.

Any such factor in the causation will, of course, need to receive a large share of attention in the treatment; and nearly always some one of them can be found, if searched for with the necessary care and skill. Whatever else may be wrong, the liver is generally embarrassed in chronic diarrhea, and a useful addition to other appropriate remedies will be very small alterative doses of podophyllin—grain 1-200 to grain 1-100 every three to four hours—too small a dosage to increase peristalsis, in adults at least, and yet seemingly enough to exert a curative influence upon many cases of diarrhea with profuse, thin stools. It is particularly effective in the so-called morning diarrhea, in which there are one or more loose and usually painless stools every morning, with no further trouble during the day. (See Lecture XXXIV.) I have controlled numerous previously stubborn cases of this kind by 1-120-grain doses of podophyllin, assisted only by a bland, digestible diet; but when this alone does not prove promptly effective, I am accustomed to prescribe in addition for any chronic form of looseness, dependent upon excessive secretion, or an irritated intestinal

mucosa from fermentation, some such combination as the following:

℞ Bismuth subnit. vel. salicylat. }
 Ichthalbin }aa 3 ii
 Cretæ preparat. }
 M. et ft. chart. No. XII.
 Sig. One in water after every loose stool.

But before prescribing the above, or any astringent, clear out the bowel by a mild physic.

When the looseness depends upon a pronounced chronic colitis, the remedies can often be applied to the best advantage per rectum. Once a day at first, and later every other day until the flux ceases, place the patient upon the back, or first upon the left side for a few minutes, and after that upon the right side, with the hips a little raised, and after a preliminary cleansing of the colon by introducing a normal salt solution, or a weak solution of sodium bicarbonate (3 i to Oii) at a temperature of about 100 to 105° F., a quart at a time, repeated until it comes away without the color or odor of feces, inject a pint of water at 90° containing a dram of bismuth in suspension, and let it remain as long as it will. In bad cases it is well to supplement this by injecting, two or three times a week, some decided astringent, such as nitrate of silver (grain iii to Oi); or an antiseptic solution such as one and a half drams of strong carbolic acid dissolved in three ounces each of glycerin, and glycothymoline or listerine, of which an ounce is then added to two quarts of tepid or warm water for one clyster. (See Lecture LXVI.)

When the bowel will not tolerate enemas well, but contracts at once spasmodically, there is often some morbid condition discoverable in the rectum or prostate gland, or, in the case of women, in the internal genitals, which should be sought for and remedied. In such cases the treatment can generally be carried out in spite of the difficulty, by placing the fountain syringe or other reservoir containing the solution not more than one or two feet above the patient, so as to lessen the

pressure, and in addition, when necessary, by raising somewhat the temperature of the liquid. Such medicated clysters often help much in the cure of an intestinal catarrh, but should never be continued long as a routine method of evacuating the bowels in stubborn constipation.

The diet in chronic diarrhea needs to be most carefully studied, for it is a difficult problem often to nourish the patient sufficiently without permitting a greater variety of aliment than can be taken without aggravating the disease. Milk in some of its forms can usually be made to agree, and we may allow well-cooked rice, freshly toasted bread, zwieback (if not too hard), or other partly dextrinized starch food, though sometimes good home-made stale bread agrees even better.

In many cases soft-boiled or raw eggs are borne well, and in nearly all, the whites of eggs. Baked white potatoes and some of the vegetable purées may be cautiously tried in the less severe cases, and often buttered stale bread can be added.

In certain cases in which there is very excessive fermentation, beginning in the stomach, and yet sufficient gastric juice, or the possibility of supplementing it well enough by administering HCl and pepsin, the most satisfactory basis of the diet at first—for, say, three or four weeks—is finely chopped beef, with a free use of hot water still further to stimulate the secretion of the digestive glands. Give with these only two or three slices of stale or toasted bread daily, and a very small amount of asparagus tips, spinach, or a leaf or two of lettuce merely as a relish, gradually adding more carbohydrates and fats as they are found to be tolerated.

In some of the worst cases the diet may have to be limited for a while to peptonized milk or other predigested foods, such as Eskay's Food, etc., and in others, Plasmon, with the help of some one of the meat powders, answers best. Boiled rice with boiled milk makes a good combination for some severe cases.

The foods which are most likely to aggravate diarrhea are first of all the raw fruits, and the sourer the worse, next the

cooked fruits, especially when sweetened, and third the crude succulent vegetables. In some cases no vegetables can be made to agree. Sugar in any form, as well as hot or fresh yeast bread, and the shell fish, are badly borne as a rule. Milk, which usually suits best, will occasionally increase diarrhea, though it is less likely to do so if boiled, sterilized, or peptonized, and even soft-boiled eggs are not always well digested by these patients.

The suitability of a diet must be judged by its effects upon the frequency of the stools and the amount of fermentation as shown by the stomach contents and feces, as well as by the amount of indican and aromatic sulphates in the urine.

In the diarrheas resulting from chronic catarrh of the appendix, the same treatment applies as in those from other forms of intestinal catarrh, except that it is even more important in them to keep the colon, especially the cecum, free of fecal accumulations and as aseptic as may be. Counter-irritation, by iodine or otherwise, over the appendix is helpful, and small alterative doses of calomel can be advantageously continued during two days of each week, for a month at a time, provided there be one or two complete (but not necessarily loose) evacuations daily. Moderate doses of galvanism (15 to 30 ma.) may also be applied locally through the cecum from side to side.

For persons thus affected who are not able or willing to diet strictly and persist faithfully with the above-outlined treatment, the operation of appendectomy should be performed.

In the comparatively infrequent diarrheas dependent upon other causes than indigestion, constipation, intestinal catarrhs, and toxæmias, opium and astringents may at times be needed; but great caution should be exercised not to resort to them until the latter varieties of the affection, requiring generally the opposite method—elimination—can be positively excluded, and such mild antiseptics and astringents as bismuth should always first be tried.

Finally, in all the forms of chronic diarrhea, the general

health should be built up in all possible ways, by an abundance of outdoor air, changes of climate at times, proper clothing, and a judicious use of water locally. It is a very debilitating disease, and other debilitating conditions aggravate it. To cure obstinate cases, the mode of life must be hygienic in all respects.

The Nervous Forms of Diarrhea following grief, fright, or any intense emotion, or from any nervous derangement, are usually transient in duration, but chronic cases do occur. These demand, in addition to the general treatment of neurasthenia, nerve sedatives with, in the more stubborn cases, bismuth, or even the stronger astringents, and sometimes some one of the opiates.

LECTURE LXXII

DYSENTERY

Definition.—The term dysentery signifies an inflammatory condition of the large, and sometimes of the small, intestine accompanied by tenesmus and the frequent passage of small mucous and blood-stained stools. It is generally considered an epidemic disease, but may occur sporadically.

Ætiology.—Each variety of dysentery has a cause peculiar to itself; all forms, however, have certain ætiologic factors in common.

Dysentery is most prevalent in the tropics, although it occurs both epidemically and endemically in the temperate zone, where it exists more frequently at the end of summer and in the autumn. In the tropical districts it is more fatal than cholera, and has caused more deaths in armies than actual warfare. Strümpel states that in the Anglo-Indian army the mortality due to dysentery is 30 per cent. of all deaths. The high death-rate of this disease in the past has largely been due to bad hygiene and the lack of proper sanitary regulations. Attention has been called by Manson to the tendency of dysentery to occur in malarial districts. This is probably due to the fact that the malarial subject is left in a weakened condition which predisposes to dysenteric infection, or the conditions which favor the development and growth of the malarial parasite are equally favorable to the existence of the bacillus of dysentery. The latter view receives the support of most investigators. The manner of infection has not been positively determined; evidence, however, tends to point to the water-supply as the principal source of the specific germ.

Constipation, and gastro-intestinal disturbances brought

about by the ingestion of bad food, especially unripe fruit, predispose to dysentery.

This disease occurs at any age and in either sex. There is no race immunity, although Kieffer,¹ from an extended experience with troops, believes that the American negro is relatively immune to amoebic and bacillary dysentery.

It is very doubtful whether dysentery is contagious; it is probably disseminated through the medium of the fecal dejections of the sick. A convenient and accurate classification of dysentery is into the following varieties: *catarrhal*, *bacillary*, *amoebic*, and *chronic*.

CATARRHAL DYSENTERY (SPORADIC DYSENTERY)

This is an acute form which occurs commonly in the temperate zone.

Ætiology.—Catarrhal dysentery may accompany the specific intestinal lesions of tuberculosis and typhoid fever, and is sometimes associated with the acute exanthems.

Simple irritants, such as the eating of green fruit or other unwholesome food, and exposure to a chilly night air after a hot day, or sleeping on damp ground may cause the disease.

Until recently no specific organism was associated with this type of dysentery, but in an epidemic at Hartwick, N. Y., Curtis was able to isolate the bacillus pyocyaneus in large numbers in the stools, and both he and Kieffer now consider this micro-organism as an important ætiologic factor. Catarrhal dysentery occurs in children as the so-called enterocolitis of the summer months. It was in the dejecta of such cases that Duval and Vedder² found the bacillus of Shiga. If their researches can be confirmed, catarrhal dysentery will hereafter be classed as a form of bacillary dysentery.

Pathology.—The morbid process is usually limited to the colon, although occasionally the lower part of the ileum is involved. The mucosa is covered with a bloody mucus, the

¹ *Phila. Med. Jour.*, January 31, 1903.

² *Jour. Exper. Med.*, February 5, 1902.

blood-vessels are injected, and the solitary follicles have undergone hyperplasia. The mucosa is eroded and the seat of superficial ulcers.

Symptoms.—A prodromal stage lasting a day or two may exist, during which there occur slight abdominal pain, anorexia, and a mild diarrhea; or the onset may be sudden. At first there is a copious and painless diarrhea; soon the evacuations become more frequent and smaller in size; the stools are streaked with mucus and blood, and their passage is accompanied by colicky pains (*tormina*) and straining (*tenesmus*). When the disease is fully established, the amount of the evacuations seldom exceeds a tablespoonful. They consist of a clear gelatinous mucus, streaked or tinged with blood. Pus may occasionally be present in them. The number of stools varies in mild cases from five to ten, and in severe cases from thirty to one hundred in twenty-four hours. The colicky pain may come on spontaneously, or after the ingestion of food, or even upon moving about in bed. The straining is a most distressing symptom; the anus becomes inflamed and is the seat of intense pain, and the bowel may be prolapsed. There may be tenderness upon pressure along the course of the colon. The disease rarely begins with a chill. The temperature at the onset is generally slight, but may range between 102° and 104° F. The tongue is coated, at first moist, then dry, and at last it may become red and glazed. The skin is dry, except during the attacks of *tormina*, when it may temporarily be moist. The pulse may be normal in the mild cases, but in the severe types it is small and rapid. There are anorexia and excessive thirst. Sometimes vomiting and attacks of hiccough occur. In severe cases there are great prostration and wasting; the evacuations become almost constant or involuntary; ulcers form in the mouth and *sordes* collect on the teeth; delirium develops, which later increases to stupor and from that to coma.

The urine is scanty and of high specific gravity, with an excess of urea and uric acid and a diminution of the chlorides; albumin, blood, and bile may be present in it.

Microscopic examination shows the dysenteric discharge to consist of red and white blood cells, and large round or oval epithelioid cells containing fat-globules, vacuoles, and putrefactive micro-organisms. Occasionally the *cercomonas intestinalis* is found in large numbers. The specific germs which have been found are the *bacillus pyocyaneus* and the *bacillus* of Shiga.

Diagnosis.—This is rarely difficult, except in atypical cases. The fever, frequent small stools containing blood and mucus, with occasionally shreds of tissue and the other intestinal symptoms, are sufficiently characteristic.

Prognosis.—Catarrhal dysentery is often curable in three or four days, but, as usually treated, lasts on the average in the mild cases about eight or nine days. The duration depends largely upon the plan of treatment followed, as well as upon the grade of the case. The severer cases often continue a month, especially when unskillfully treated in the beginning. Recovery nearly always occurs in the temperate zone, except in persons whose strength has been reduced by previous illness or chronic disease. In infancy and extreme old age the prognosis is much less favorable. Occasionally it becomes chronic.

Treatment.—Mild cases of catarrhal dysentery can often be checked in the very beginning—when the first mucous stools appear—by repeated small doses of castor oil, calomel, or any saline laxative. It was a cause of surprise and no little mortification to me, during my first year or two in practice, to find that the old women could do more for dysentery by even one or two moderate doses of castor oil than it was possible to accomplish by either ipecac or any combination of opium and astringents upon which I had been taught to rely. But it was not until after many years of experience with astringent mixtures and hard-fought battles with numerous stubborn cases, which only yielded at the end of ten to fourteen days of extreme suffering, and the supervention in some cases of complete exhaustion, that I learned the magic efficacy of the treatment by repeated small doses of one of the saline laxatives.

Either Epsom or Rochelle salt is employed by me as a rule, and I have the patient take one or more doses, large enough at first to produce feculent stools, instead of the small dysenteric evacuations of mucus and blood, and this is generally to be effected in the case of adults by a teaspoonful dissolved in a goblet of moderately hot water, and repeated once or twice at intervals of three or four hours. In the milder cases this slight purgation may abort the attack completely. If not, as soon as the typical dysenteric stools, voided with pain and tenesmus, have been thus changed to feculent ones, passed with little or no pain, you may direct the dose of the saline to be reduced to one of 10 to 20 grains, and taken in half a goblet of water, flavored if necessary, every three hours. If this should act too much as a physic, the dose must be reduced, and if, on the other hand, there should occur any tendency to a return of the small stools containing only a few teaspoonfuls of bloody mucus, shreds, etc., with straining and pain, the dose must be again increased. Hot poultices or compresses will also promote the cure.

With this plan of treatment and a diet of milk, or better, milk with one-third limewater, taken not more than a tumblerful at a time, once in three or four hours, I have seen numerous cases of catarrhal dysentery completely cured in three days, instead of the eight, ten, or more usually required when the treatment is that by astringents and opium.

If, at the end of three days of such a treatment, the feculent stools should not show a tendency to cease, 5- to 10-grain doses of bismuth subnitrate, given after each, are usually all that is needed to stop them. If not, I add 1 grain of Dover's powder to each dose, and if an examination shows any ulceration or persistent catarrhal inflammation in the rectum or sigmoid flexure, enemas of bismuth, a dram to the pint, or later, if necessary, enemas of one of the stronger astringents mentioned under the head of the treatment of bacillary dysentery, should prove effective. Special topical applications to sluggish rectal ulcers may be necessary in some exceptional cases, and a very convenient and effective remedy for such lingering

trouble in the rectum or sigmoid is a suppository containing 3 to 5 grains of ichthyol, one of which may be inserted after the morning stool and one at bedtime.

BACILLARY DYSENTERY

Definition.—Bacillary dysentery is a serious form of the disease and runs a more protracted course than the others. It is accompanied by necrosis and ulceration of the mucosa of the colon, and the formation of croupous exudate or pseudo-membrane. It occurs in epidemics with a mortality-rate sometimes as high as 45 per cent. It is especially liable to occur in armies, asylums, prisons, and the like. Bacillary dysentery is also known as epidemic, specific, and diphtheritic dysentery.

Pathology.—In the mild cases the characteristic lesion is a thin, grayish-yellow false membrane, covering the folds of the colon. In the severe form, there is a diphtheritic infiltration of all the coats of the large intestines, which undergo coagulation necrosis. Considerable sloughing occurs, leaving extensive ulceration of the bowel. The disease process may be confined to the rectum and the sigmoid flexure; occasionally, however, it extends to the ileocecal valve, and even into the ileum.

Ætiology.—The specific cause of this type of dysentery is the *bacillus dysenteriae* discovered by Shiga¹ during the Japanese epidemics. Flexner and Barker found the same bacillus causing dysentery in the Philippines. The bacillus dysenteriae belongs to the typhocolon group, midway between the bacillus coli communis and the bacillus typhosus. It resembles closely the typhoid bacillus, but Flexner found that it is not influenced by the blood-serum of typhoid patients, but does respond to the serum from dysenteric cases, by which the bacillus typhosus remains uninfluenced. This micro-organism is a slender rod, 1 to 3 microns long, occurs in small groups, singly or in pairs, and grows upon all the ordinary media. It is stained by all the common aniline dyes, but is not stained by

¹ *Centralbl. f. Bakt. u. Parasitenk.*, 1898, xxiv., No. 22-24.

Gram's method. It is slightly motile and possesses flagella which surround its body.

Symptoms.—The symptoms are usually those of the catarrhal form, but exhibit an unusual intensity from the onset. It may begin with a chill or a rapidly rising temperature. There are early prostration and delirium. The abdomen is tender and may simulate typhoid fever. The abdominal pains are very severe. The stools usually contain more blood than in the catarrhal form. Other elements in the dejecta are membranous shreds, thin black sloughs, pus, and mucus. The stools are dark brown in color and often of very fetid odor; or at times may be odorless.

Secondary Diphtheritic Dysentery.—This is a name given by some authorities to a mild form of bacillary dysentery. It occurs as a complication of many acute and chronic diseases. It may be the terminal event in chronic nephritis, chronic cardiac disease, pulmonary tuberculosis, and in various cachexias, as well as in certain acute ailments, such as typhoid fever and pneumonia. The symptoms consist of three or four loose bowel movements daily, containing a little blood and mucus. Tormina and tenesmus may be wholly absent, or, if present, be very slight.

Diagnosis of Bacillary Dysentery.—The diagnosis is positively made by finding the specific germ in the stools, and by means of the agglutination reaction. The technique of the latter is identical with that of the Widal test and serves to distinguish dysentery from all other infections. Additional aids in the recognition of this disease are the intestinal symptoms, the odor of the stools, and the presence in the latter of false membranes. The occurrence of bacillary dysentery in epidemics is also of diagnostic value.

Complications and Sequels.—Hemorrhage and perforation may occur in the same manner as in typhoid fever. Peritonitis may develop either through perforation, or by extension of the inflammation from the walls of the intestines. Other complications are gastro-intestinal catarrh, acute bronchitis, pleurisy,

pleuropneumonia, endocarditis, pericarditis, phlebitis, ascites, anasarca, meningitis, cerebral embolism, ulcer of the cornea, and nephritis. Abscess of the liver, which is commonly held to be the most frequent of all the complications of amœbic dysentery, except when it occurs in epidemic form, is rare in the bacillary type.

Bacillary dysentery has a tendency to relapse, one infection increasing the patient's susceptibility to another attack. It may be followed by a chronic dysentery or diarrhea, paralysis, rectitis, and stricture of the bowel. A septic arthritis of the larger joints may supervene, the so-called "rheumatic dysentery of Sydenham."

Treatment.—First of all, in the treatment of bacillary dysentery, absolute rest is imperative. The patient should be confined to bed and the use of a bed-pan insisted upon. It is even recommended that to obtain local rest, a large, thick, and firm pad be applied to the abdomen and retained there by a broad, tight binder. The medicinal treatment should be begun with a dose of castor oil or a saline purge, which tends to deplete the mucosa. In the later stages of the bacillary form purgatives are harmful. Ipecacuanha has long been considered almost specific in its management, and is best given in large doses, though some authorities prefer small and frequent doses of the drug. The following is the classic method of prescribing it: Nourishment of every description is withheld for three or four hours. Then 15 to 25 drops of the tincture of opium are administered. In from twenty to thirty minutes, when the opium begins to take effect, from 30 to 60 grains of ipecac are administered in powdered form, stirred up in one or two ounces of water. The patient should be kept as quiet as possible; the slightest exertion or disturbance may bring on an attack of vomiting. If the drug is vomited within an hour, repeat the dose as soon as nausea subsides. If the ipecac is retained two hours or more, sufficient has been absorbed to produce the desired effect. The continuance of the ipecacuanha will depend upon the character of the stools. One

dose may bring about a feculent stool, but failing improvement, the drug should be continued twice a day in 10-grain doses for several consecutive days. After the administration of this drug no food or drink is allowed, except the sucking of a little ice, for at least three hours, when small and frequent feedings may be begun. As the dysenteric patient may also be infected with malaria, it is well, in case the ipecac fails, to give quinine in 5-grain doses every six hours for two days. Besides the ipecac, other drugs are often indicated in the treatment of bacillary dysentery. Opium is the most valuable means of allaying pain, restlessness, or undue peristalsis. Morphine is the best form of it, and should be administered hypodermically. A 2-grain opium suppository, or 30 minims of the deodorized tincture by enema, may relieve the tenesmus. After the more intense symptoms have subsided, bismuth, and especially betanaphthol bismuth, is a valuable preparation. Anders recommends the continued use of Dover's powder, bismuth subnitrate, and salol. The bichloride of mercury in 1-100-grain dose, every two hours, has given good results. Stengel¹ recommends the employment of sulphur. Weisenberg² also reports excellent results from the drinking of the water of a sulphur spring by the dysenteric patients in Manila. Tyson advises the use of iodoform in 1-2- to 3-grain doses in capsule or pill.

In the tropics simaruba bark, monsonia orata, and the astringent juice of the unripe guava fruit are popular, and, it is claimed, effective remedies which, however, are not much employed in the temperate zone.

Opinions differ as to the local treatment of acute dysentery by means of enemas. Some believe this to be the rational method, while others condemn it. Usually the bowel is so irritable that this mode of medication is difficult. To relieve the irritability, cocain, either in solution or in suppository, or a laudanum enema is useful. The most valuable agents are

¹ Proc. Phila. County Med. Soc., 1902.

² *Phila. Med. Jour.*, March 14, 1903.

silver nitrate (grn. ss. to f3i), 1-2 to 1 per cent. tannic acid, 1 to 2 per cent. salicylic acid, or mercuric chloride solution (1-6000). Lukewarm injections of potassium permanganate solution (1-4000), twice daily, have given good results in the hands of some clinicians. Shiga has produced a serum from goats by means of which he was able, in an epidemic in Japan, to reduce the death rate from 34.7 to 9.6 per cent. This remedy has, however, not been made on a commercial basis, and is therefore not yet available.

The diet in the acute initial stage should consist of rice water, weak chicken broth, whey, very weak tea, barley water, or koumiss. Later a pure milk diet is indicated. The stools must be watched to determine whether the food is expelled undigested, and if so the diet must be decreased in amount, altered in quality, or what is sometimes better, predigested.

AMŒBIC DYSENTERY

Ætiology.—This form of dysentery is due to the amœba coli, which was discovered by Lambl in 1859. Kartulis,¹ however, was the first observer to claim it to be the specific cause of tropical dysentery. Since then this micro-organism has been found constantly present, not only in the stools, but also in the coats of the large intestine and in the liver abscesses secondary to this form of dysentery. If a small fleck of the flocculent mucus of a dysenteric stool, immediately after being passed, is placed on a warm (100° F.) microscope stage, the amœba may be recognized. The amœba coli is about five times the size of a red blood cell; it is colorless, or very faintly greenish in hue, and consists of a granular endosarc, with a narrow zone of clear colorless ectosarc. It contains a nucleus and one or more vacuoles. When recently voided, it is in constant characteristic motion. This parasite is sometimes found in very great numbers. Then again only a few may be present. The number of amœbæ present seems to bear very little, if any,

¹ Massenhafte Entwicklung von Amœben in Dickdarm, Virchow's *Archiv*, 65, 1875.

relation to the severity of the disease. If the pus from a liver abscess shows no amœbæ, a gauze swab should be twisted, with considerable pressure, against the broken-down liver tissue forming the abscess wall; in this manner one obtains a mass of liver cells and leucocytes, among which, in all probability, the amœbæ will be found. The specific germ probably

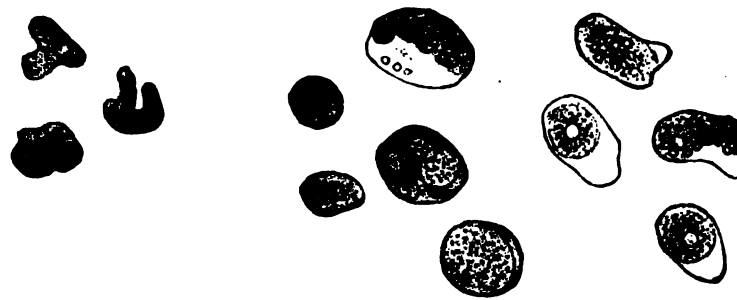


FIG. 97.—*Amœba dysentericæ*. (After Roos.)

enters the body through the drinking water. (See annexed illustration of the amœbæ.)

Pathology.—There is œdematous swelling of the intestinal wall and a cellular infiltration of the submucosa. The surface of the mucous membrane presents circumscribed thickenings of various size, in which there are cavities filled with a gelatinous mass. The openings to these cavities or ulcers are very small in comparison with the extent of destroyed tissue underneath the mucosa. The latter sloughs away, leaving extensive irregular ulcers; these may be connected with each other by fistulous channels beneath the mucosa. This ulcerative process usually involves only certain parts of the colon, like the hepatic and sigmoid flexures, but occasionally the entire large intestine is affected. If the disease is well advanced, healing may be found more or less extensive; contraction of the scar tissue causes irregularities in the surface of the mucous membrane and occasionally results in the formation of strictures. Mi-

croscopic examination of the infiltrate shows the absence of pus and a proliferation of the fixed connective-tissue cells. Amœbæ are found in the walls, the base of the ulcers, in the lymph channels, and rarely in the blood-vessels.

Symptoms.—Amœbic dysentery may begin gradually or suddenly. It usually comes on insidiously with a moderate and painless diarrhea, alternating with short periods of constipation. Whether sudden or gradual in onset, there are irregular periods of intermission (from one day to three weeks) and of exacerbation (one to ten days). There is usually a slight fever, which may be entirely absent; nausea and vomiting are uncommon, and abdominal griping and tenesmus are present only at the beginning. The stools are at first mucous and bloody; later they become fluid and yellowish gray in color, containing mucus and, at times, blood; they vary in number from six to twelve in twenty-four hours. Active amœbæ are found in the dejecta.

This disease is usually accompanied by a progressive loss of flesh and strength and a marked anæmia.

Complications.—Hepatic abscess is the most frequent and serious complication. It is liable to develop in from four to twelve weeks. From 20 to 25 per cent. of amœbic dysenteries cause liver abscess. The latter may be single or multiple; the single abscesses are usually situated in the right lobe of the liver, near its convexity. The multiple abscesses are disseminated. They may be the size of a pigeon's egg, or as large as a cocoanut, or even larger. The pus found in such an abscess is thick, reddish-brown or chocolate-brown in color. Microscopically it contains necrotic liver tissue, pus cells, amœbæ, elastic tissue, and blood.

The liver may also be the seat of circumscribed necrosis, scattered throughout the organ, caused by the action of the amœbæ. Perforation of the intestinal wall because of ulceration may lead to peritonitis; if this occurs in the rectum, a proctitis results, or, if in the cecum, a perityphlitis occurs.

Diagnosis.—The presence of the other dysenteric symptoms

above described, with the amœba coli in the stools, establishes the diagnosis.

Prognosis.—Favorable cases of amœbic dysentery last from six to twelve weeks. The mortality is much higher than in the catarrhal form. In some epidemics the death rate may reach 70 to 80 per cent.; in sporadic cases, the rate is much lower, averaging about 5 per cent. This disease shows a tendency to relapse, and the convalescence is prolonged because of the anæmia and debility.

Treatment.—In severe cases the patient should be kept at rest in bed, but in the milder forms may be allowed to be up and about for a short time daily and directed to take slight exercise in the open air. The food must be highly nutritious and easily assimilable. The medicinal treatment should include, as a rule, that already described above as applicable to the treatment of bacillary dysentery. The most satisfactory single remedy, however, for this variety of dysentery has been found to be rectal injections of a warm solution of quinine (1 to 5000, 1 to 2500, or 1 to 1000).

CHRONIC DYSENTERY

Chronic dysentery usually succeeds acute dysentery, although it may be a subacute or chronic process from the beginning in amœbic cases. The amœba coli is the cause of most cases of chronic tropical dysentery.

Pathology.—The lesions found are similar to those described in the other varieties of dysentery. Ulceration may be present or absent. Some of the ulcers show no signs of healing, while, in others, a process of repair is going on. In some areas the healing is completed and the mucosa presents a rough, irregular, puckered appearance. All of the coats of the bowels are thickened. The mucous membrane presents black or slate-gray patches, due to the extravasation and disintegration of the blood. The glandular elements may be the seat of cystic degeneration.

Symptoms.—The symptoms are not especially characteristic.

The stools vary from four to twelve in twenty-four hours, may be fluid, frothy, or semifluid, yellowish or brown; occasionally they contain mucus, undigested food, rarely blood, pus, or necrotic shreds. Constipation may alternate with diarrhea, in which case the bowel movements are apt to be scybalous, and each separate fecal mass is covered with tenacious mucus. The amoeba coli is constantly present in the amoebic form, but, in the bacillary form, the Shiga bacillus disappears as the disease becomes chronic, particularly when there is marked ulceration.

Acute exacerbations are not uncommon. Tormina and tenesmus are rarely present, except during the exacerbations. Pressure in the left iliac fossa over the sigmoid flexure, and sometimes in the right iliac fossa over the cecum, elicits pain; the sigmoid flexure may be felt to be indurated, enlarged, and tender. Flatulence may cause considerable distress. The tongue is red and glazed or dry and fissured. The appetite is impaired and digestion poor. Anæmia is usually present, and the emaciation may be extreme.

Complications.—The complications are those of the acute form. Because of extreme debility the patient is very subject to intercurrent disease, such as pneumonia, cardiac failure, or tuberculosis. It is claimed that ulceration of the cornea may be a complication. Persistent indigestion and irritability of the bowels may follow chronic dysentery.

Diagnosis.—The history of an antecedent acute attack, the occurrence of exacerbations, together with the characteristic dysenteric stools, serve to distinguish this disease from chronic diarrhea. It is differentiated from tuberculous ulceration by the absence of a family history of tuberculosis or of tuberculous disease in other parts of the body.

Prognosis.—This depends upon the severity of the symptoms, the duration of the disease, and the extent to which the health of the patient has been compromised. It may be prolonged over a period of months, or even years.

Treatment.—Internal medication is considered by many

writers as of little value in chronic dysentery, but benefit has been reported from the use of the following: 5 to 10 grns. of zinc oxide, three times a day; salol, alone or in combination with bismuth; sulphur in 10-grn. capsules, three or four times a day, with sufficient opium to overcome the laxative effect. Mercuric chloride (corrosive sublimate) in 1-100 grn. doses every two hours has been employed with marked success in this disease. In my earlier practice I encountered a number of previously stubborn cases in which it proved markedly successful with the help of an exclusive milk diet. (See *Philadelphia Medical Times* of 1879.) One such case which had yielded to the treatment, but relapsed several times in consequence of the fact that the patient, who was a sailor, could not, when on a cruise, follow the diet prescribed, was finally cured completely by a toxic dose of litharge—about a teaspoonful—which the patient took on the advice of some lay friend. He suffered for several days afterward from violent lead colic and came near dying, but, after convalescing from the effects of the remedy, remained afterward free of dysentery.

The local treatment is of special importance in the management of chronic dysentery. The remedy of greatest value is silver nitrate. A solution of this preparation is made by dissolving 10 to 20 grains in a pint of water; of this one-half to one pint may be carefully injected every other day, and some bold authorities advise the use of three to four pints in the same way. Before administering the silver enema, the bowel should be irrigated with a weak solution of sodium bicarbonate, and care should be exercised that nearly all the former solution escapes again. The days on which no silver enema is given, the patient should receive rectal injections of antiseptic solutions, such as mercuric chloride (1 to 6000) or 1 to 2 per cent. salicylic acid. Other preparations useful in injections are creolin, copper sulphate, zinc sulphate, alum, iodide, carbolic acid, and chlorine water. During acute exacerbations these injections must not be given, but the patient is to be treated as in acute dysentery.

The dietary should follow the same lines as in acute dysentery, but be more nourishing. Milk is usually the best food.

Changes of climate and sea voyages are often beneficial.

As a last resort in chronic and apparently hopeless cases, operative treatment may be instituted. The object is to put the colon at rest, and also to facilitate through-and-through irrigation. The colon is brought up and fastened to the edges of an incision in the right side of the abdomen, and is irrigated directly through this opening. This procedure has, in some cases, cured chronic dysentery.

LECTURE LXXIII

MEMBRANOUS CATARRH OF THE INTESTINES (COLICA MUCOSA, MYXONEUROSIS INTESTINALIS MEMBRANACEA)

THIS affection is doubtless rather more prevalent in the United States than in Europe, and was studied by various American writers before it had attracted special attention abroad. The late Dr. J. M. Da Costa was probably the first to publish a full and thorough scientific paper concerning it.¹ Various theories have been held regarding its ætiology and pathology, the prevailing view at present being that the abundant secretion of viscid mucus which characterizes the affection is due to a disturbance of the innervation of the intestine—especially of the colon, where the excessive mucus is chiefly formed—or, in other words, that it is a neurosis.

There is much to be said in favor of this explanation of it, and von Noorden, especially, has very ably championed it in his recent monograph on the subject,² the American edition of which was edited by me. But it is generally admitted that a certain proportion of the cases presenting the symptom mucous colic are associated with a true enteritis.

While some observations have apparently shown that in certain cases of the affection no catarrhal inflammation existed, it does not seem to me satisfactorily demonstrated that there may not be, in even the cases classed as neurotic, a slight degree of enteritis, and I prefer, therefore, not to include this lecture upon the subject among the neuroses of the intestines. Nevertheless, it cannot be denied that in most if not all in-

¹ *Am. Jour. Med. Sciences*, October, 1871.

² "Membranous Catarrh of the Intestines," New York, E. B. Treat & Co., 1903.

stances, the patients are hysteric or neurasthenic, and that the nervous constitution is a strongly predisposing cause. Von Noorden himself says: "The scanty anatomic material at our disposal, therefore, teaches us, on the one hand, that colica mucosa may be one of the symptoms of genuine enteritis, and, on the other hand, that this affection may also occur without any essential anatomic lesion of the mucous lining of the intestine, or even without any anatomic lesions whatever."

Nothnagel holds to the view that there are two distinct diseases, one a true enteritis, complicated by the discharge of membranes, etc., from the bowel, and often by colic, and the other a strictly neurotic affection in which the latter symptoms are independent of any inflammatory process. Ewald enunciated the same opinion in a recent noteworthy paper.¹ He calls the neurotic form of the affection "Myxoneurosis Intestinalis Membranacea."

Ætiology.—All are agreed that nervous persons are most afflicted with this disease, that hysteria and neurasthenia are decidedly predisposing conditions. So, also, are displacements of the stomach, colon, or kidneys. Peritoneal adhesions and eye-strain, according to Morris of New York, are other causes of the intestinal neuroses, including possibly mucous colic.²

Careful studies have been made relative to associated gastric conditions, but no particular fault in the stomach, except displacements of it, has been found to be especially provocative of colica mucosa. It occurs with excessive, as well as with deficient gastric motility, and with both the extremes of gastric secretion, but von Noorden, in seventy-six cases, found four only suffering from achylia gastrica, while "in the others there was comparatively frequently a condition of hyperacidity," by which he undoubtedly means hyperchlorhydria. Ewald includes the climacteric among predisposing conditions.

Prolonged constipation, and especially constipation dependent upon a long-standing chronic intestinal catarrh of

¹ *Amer. Med.*, February, 1904.

² *N. Y. Med. Record*, December 26, 1903.

the ordinary form, though of mild degree, is probably one of the most common causes of membranous catarrh of the intestines. Uric acid or the uratic diathesis, and especially such results of an imperfect metabolism as the xanthin bases, are believed to be capable also of causing the disease now under consideration.

Symptoms.—Colic is usually given as one of the most prominent symptoms, and this is true, as a rule, of the worst types; but I very often encounter cases in which nervous persons discharge much mucus from the bowel, including membranous pieces, shreds, strings, etc., without suffering at all from the colicky pain described as typical of the affection. The pieces of membrane thrown off are of various sizes and may be in long stringy pieces, or perfect casts of portions of the colon.

The frequent passage of such membranes and the abnormalities in defecation, usually constipation, constitute with the marked nervous tendency the only constant distinctive symptoms of the disease.

In typical cases the colic is a very conspicuous feature, and is usually most marked when the bowel movements have been most deficient. The pain is often severe, and continues, as a rule, until a complete evacuation, not only of the feces, but also of the retained masses of mucus, can be obtained. After such an evacuation the colic and all pain disappear, not to return until there has been a re-accumulation of the mucus. Patients thus afflicted generally learn the great importance of keeping their bowels freely open, and, therefore, try to avoid letting them become confined.

Though a colicky pain relieved by the passage of a quantity of mucoid membranes or masses will be observed in the severer cases, in the milder ones there will be, instead, often merely a dull discomfort in the bowels which increases toward evening and disturbs the sleep at night.

For the rest, more or fewer of the symptoms constantly observed in hysteria or neurasthenia, as well as those seen in chronic indigestion, will be present.

The most constant and conspicuous of these to be noted are constipation and intestinal flatulence, impaired sleep, irritable temper, and a dirty pallor of the skin.

Diagnosis.—In most instances you could have no difficulty in recognizing a case of membranous catarrh of the intestines by the peculiar stringy or membraniform pieces of mucus passed with or without the admixture of feces and accompanied usually by colicky pain. In case of doubt, a microscopic examination of such pieces would show their mucous character and differentiate them from skins or pulpy portions of fruit, etc.

It is important to distinguish, when possible, the cases in which a true colitis of sufficient extent to demand attention in the treatment is complicated by the formation and passage of membranes accompanied by colic, since for these the diet and therapy generally need to be modified. This cannot always be done; usually, however, when there exists a decided colitis, there will be tenderness over the portions of the bowel involved and more or less discomfort, or at times even pain in the colon at some part of every day, especially for several hours preceding an evacuation, or when constipation is unrelieved, most of the time. But in a case of membranous colonic catarrh, in which there is either no true inflammation or only a very slight degree of it, not sufficient to interfere with the success of the treatment described below, there is not likely to be sensitiveness to pressure or palpation, and an attack having ended with a free opening of the bowels and the passage of the accumulated membranes or masses of mucus, the patient may feel well and have no discomfort in the intestines for days or weeks.

Pathology.—In those forms of membranous catarrh associated with a true enteritis or colitis, a swelling or thickening and serous infiltration of the mucosa exist with usually proliferation of the connective tissue, as in the ordinary types of such chronic inflammations. In the other forms which by many writers are held to be dependent entirely upon a neu-

rosis, the hypersecretion of mucus resulting from some unknown disturbance of the innervation, no inflammatory lesion, as a rule, can be made out during life by any means at our command, and in a very few well-observed cases which have afterward come to autopsy, it is said that no evidences of inflammation in the mucosa could be demonstrated. Boas considers the far greater number of cases of so-called colica mucosa, which at autopsy showed definite lesions of enteritis, as "without doubt of much greater importance than any negative," while von Noorden maintains, on the contrary, that even the occasional observation of such a clinical case, which reveals a perfectly normal condition of the intestinal mucosa on autopsy, is far more significant.

The mucus may be in bands, strings, pieces of membrane of reticulated structure, or in the form of a cast of the bowel. There is no sufficient proof that it differs essentially from the mucus in other forms of enteritis, except that it is tougher and more sticky in consistence, which is doubtless a result of inspissation, since constipation is nearly always present in these cases, and the mucus thus is longer retained.

Ewald, in the paper already cited, describes as follows the mucous masses which make up much of the stools which are found in both forms of colica mucosa:

"They are composed of tenacious mucinous bodies, plus fibrin in small amount, nucleo-albumin, and globulin. The mucin can be differentiated from the fibrin by using triacid stain. The histologic peculiarities of these slime masses have been studied by Wolf, Ewald, Nothnagel, A. Schmidt, Westphalen, and others. They consist of a homogeneous, somewhat opaque ground substance which is interspersed with cell detritus. This detritus is composed of nuclei which are recognized because of their strong refractile properties, cell-elements, epithelial and round cells, as well as peculiar shining flakes which are thought to be due to hyaline degeneration or an imbibition of soap. The epithelial cells usually show granular degeneration, are without demonstrable nucleus, vacuolated

and frequently broken up. Besides these, there are cholesterol crystals, needles of the fatty acids, triple phosphate crystals, particles of undigested food, bacteria, and occasional red and white blood cells. It sometimes happens that there are sand-like concretions which resemble ground white pepper and are easily mistaken for the seeds of strawberries or currants, but their character can be proven by the addition of acetic acid, in which they are soluble."

Prognosis.—Membranous catarrh of the intestines is rarely fatal, except indirectly, when long neglected, but under the forms of treatment hitherto generally in vogue, has proved rather difficult to cure thoroughly. The usual course has been slow improvement, and when after prolonged treatment an apparent cure has resulted, there would be a strong tendency to relapses from slight causes. Von Noorden, however, who treats the disease in an original manner, as will be described below, reports a recovery in sixty out of seventy-six cases, of which thirty-eight remained well a year after the termination of the treatment, and the majority of the cured patients remained well after many years.

Treatment.—Since von Noorden has been so extraordinarily successful in the cure of colica mucosa, I have recently adopted his method of treatment in the main, for the neurotic cases not demonstrably complicated by colitis or enteritis, with results which are decidedly better than those previously obtained. I will, therefore, give you a condensed account of the method as described in his monograph already cited.

Symptomatic Treatment.—It is obviously desirable to terminate a typical acute attack of mucous colic as soon as possible, and, at the same time, to relieve promptly the pain from which the patient suffers. Both these objects are best achieved by putting the patient to bed, applying hot applications such as flaxseed-meal poultices or hot wet compresses over the abdomen, the administration of anodynes, and flushing the colon to remove the accumulation of mucus. The anodyne should consist of either morphine and atropine hypodermically, or the same

in larger doses by suppository. Von Noorden recommends 4 cgr. (2-3 grn.) each of ext. opii and ext. belladonnæ in suppository. Such a combination, aided by the hot applications and repeated in a few hours if necessary, relaxes the spasm and facilitates the evacuation of the spastically contracted bowel, thus giving prompt relief and quickly ending the attack. In the absence of the narcotic, the colon douche would probably irritate, especially if any such an excitant as soap or glycerin were added. Von Noorden includes salt in the same category with irritants, but most of us have found that when salt is dissolved in water at the temperature of the body, in a strength of not more than a dram to the quart, the result is a more soothing mixture than plain water. One to two hours after the first water enema, you may inject half a pint to a pint of sweet oil or cotton-seed oil to insure the thorough softening and removal of any remains of hardened and adherent mucus.

Causal Treatment.—Formerly, the chief attention in these cases was given to the treatment of the hysteria or neurasthenia in the always neurotic patients—generally young or middle-aged women—who suffered from this affection. Von Noorden believes that, while not neglecting this predisposing factor in such cases, we should earnestly combat the constipation which excites the attacks.

Dietetic treatment will accomplish most. The usual prescription of a bland, non-irritating diet, which leaves too little residue to overcome the constipation is condemned, and instead the patient is required to take, beside a large amount of milk and cream for the fat they contain, a very coarse laxative diet including the grains, legumens, and the other vegetables which have in them much cellulose; also plentifully of the seedy fruits such as figs and the berries—especially currants, gooseberries, etc.—just the sort of diet which is certainly contra-indicated in any case in which a decided enteritis exists. Hence you should be careful to differentiate your cases and exclude from the number treated by this von Noorden method any in which a true colitis is a prominent feature.

In applying the diet rules here prescribed, it is also of the highest importance to study the metabolism of each patient, and vary accordingly the choice and quantities of the different kinds of food ordered.

Von Noorden considers the *improvement of the general nutrition* the fundamental preliminary condition to be fulfilled if we would effect a permanent cure, and finds that in many of the cases of colica mucosa, this is best accomplished by beginning with the familiar rest treatment, including systematic full feeding. And in the other cases, as will be seen from the subjoined detailed directions as to diet, etc., he secures a partial or modified rest treatment. He advises strongly that the cure be carried out in an institution or somewhere away from the patient's home. His failures have been mainly among patients treated at home, and we are all familiar with the difficulties encountered in these cases under such conditions.

The average duration of the systematic treatment with extra full feeding, as here laid down and carried out by von Noorden, is three to six weeks, or on the average four weeks.

While it is impracticable to prescribe any scheme of diet which will suit every case, even of the same disease, and von Noorden deprecates any attempt to do this, he submits the following as a general outline of the plan which he has found serviceable in many cases:

Von Noorden's Detailed Directions for the Average Case of Membranous Catarrh of the Intestines.—"In the morning in bed, at seven o'clock.—Three-tenths of a liter of milk and cream (two parts of milk and one part of thick sweet cream, ordinarily O. Rademann's sterilized Holstein cream); then, usually, a rub with moderately cold water.

"At eight o'clock.—One-quarter of a liter of Kissingen (Racoczy) or Homburg Elisabeth water.

"At nine o'clock.—Three-tenths of a liter of the milk-cream mixture, or of thin tea or coffee with much cream; sometimes, too, cocoa prepared with cream or butter and sweetened with sugar of milk. In addition, 50 to 70 grams ($1\frac{1}{2}$ to $2\frac{1}{4}$ oz.)

of coarse bread containing much cellulose, and 30 to 50 grams (1 to 1½ oz.) of butter.

“ At ten-thirty.—If necessary, a massage of the intestine, or hydrotherapeutic treatments of different kinds; sometimes electrization of the colon.

“ At eleven o'clock.—Soup made from leguminous plants boiled with bacon or Westphalia sausages; in addition, Graham bread with plenty of butter. Also a glass of breakfast wine or a small glass of brandy.

“ At one o'clock.—Some meat dish, as much as wanted. In addition vegetables of different kinds, boiled or baked potato with butter. Fruit with coarse skins and large seeds, as currants, gooseberries, cranberries boiled, or a pound of grapes. One-half a bottle of light Moselle wine. After eating, rest in bed for an hour and a half, with hot applications to the abdomen.

“ At four o'clock.—A light lunch similar to the breakfast at nine o'clock. Then a walk of one and one-half to two hours.

“ At seven o'clock.—Supper like the dinner; sometimes, too, junket or fruit soup. In addition, 50 to 70 grams (1½ to 2¼ oz.) of Graham bread, with plenty of butter.

“ At nine o'clock.—Three-tenths of a liter of the milk-cream mixture as in the morning.

“ On the first and the third day of the treatment, an oil clyster is usually given in the evening in order to prevent all disturbances that might possibly arise. It is rarely necessary to repeat this later on.

“ The average quantity of cream consumed amounted in our cases to one-half a liter a day; this amount containing 150 grams (4¾ oz.) of pure butter-fat (the manufacturers of the sterilized cream, mentioned above, guarantee a percentage of 30 per cent. of butter-fat). The daily average of butter equaled 230 grams (7¼ oz.). Of this quantity about two-thirds were eaten as pure butter with bread and potato, or with vegetables and fish. The rest was taken cooked with the food.

"The average quantity of Graham bread was 200 to 250 grams ($6\frac{1}{4}$ to 8 oz.). We usually give the bread sold by O. Rademann (Frankfurt-am-Main) under the trade-mark 'D-K.'

"According to our experience, mild disturbances occur under this régime. It is well to prepare the patients for this in advance. In order to counteract these disturbances, it is a good plan to keep the patients in bed for the first few days; in addition, hot compresses, or possibly suppositories of three-fifths cgr. (1-10 grn.) of extr. belladonnæ, and the oil clysters mentioned above, may be given (this on the first and third days of the treatment). After the first two to four days, the stools that are evacuated assume a normal consistency and a normal appearance. As soon as this occurs all the disturbances usually disappear; in particular, all painful sensations. Mucus, however, is passed for some time longer. This mucus, to judge from its appearance, is freshly secreted. This demonstrates that the hyperirritability of the mucus-secreting apparatus is not allayed at once. At the same time the mucus no longer accumulates and the quantities passed are very insignificant. If the cure takes a normal course, the secretion of mucus does not continue for longer than a week. In at least one-half of the cases the secretion of mucus ceases at once, as soon as soft motions are evacuated, and never returns thereafter."

Comments on the von Noorden Method.—It will be observed that the above-described plan includes the administration every morning of one-quarter of a liter (about a gobletful) of one of the natural chloride-of-sodium waters, which exert a very slight laxative action on many sensitive patients, and a curative influence on the intestinal mucosa. In my earlier attempts to effect cures in these cases, as well as in others in which constipation was a marked symptom, by resorting to a coarse laxative, as various German authors advise, I failed often, and doubtless because the saline water was omitted. The oil enemas, too, are most valuable adjuvants in all such cases, and are still more useful—even indispensable—in the treat-

ment of constipation, associated with the familiar types of chronic enteritis or colitis.

The fact that the Carlsbad and other alkaline waters are strictly contra-indicated in the affection under consideration, as well as in all gastro-intestinal derangements accompanying or dependent upon nervous or depressed conditions, is insisted upon by most writers, and is mentioned also by the author above quoted. The latter insists further upon massage of the large intestine, especially over the sigmoid flexure, as a most valuable adjunct in the treatment of these cases, notwithstanding that it is generally contra-indicated in spastic cases. His view is that, with the usual bland diet, massage does aggravate all forms of spastic constipation, including that occurring in colica mucosa; but when his full laxative diet is adhered to, he finds that massage agrees perfectly well, and promotes complete evacuations.

The After-Treatment.—When the three to six weeks of special treatment with full or partial rest, massage, electricity, etc., and very full feeding on an exceptionally coarse laxative diet are over, the after-treatment is highly important. The mechanical measures, saline water, oil enemas (when the last need to be employed), are now to be omitted, and the patient is required gradually to resume an ordinary but rational diet appropriate to his circumstances and place of residence.

It is customary after most of the special cures at German springs or bathing places, to send the patient to some invigorating climate for a few weeks, but von Noorden cautions against ordering patients who have pursued the above-prescribed course for colica mucosa to either the seashore or to any high altitude. He does not know why these localities disagree with convalescents from the affection under consideration, but experience has taught him that they do. He prefers that such patients should go to some wooded country at a moderate altitude, and there take frequent short walks—not overtaxing their strength.

The educational process of adaptation to an ordinary diet

may be finished in a few weeks, or exceptionally, may take several months. If the patient too soon goes back to a less bulky diet before the habit of daily spontaneous and sufficient bowel movements has been acquired, and especially if there is a return to any objectionable habits of eating, there is likely to be a relapse; but once the normal habit is fully restored, and a rational mode of living is thenceforward followed, the cure remains a permanent one.

Treatment of Colica Mucosa in True Enteritis.—In those membranous catarrhs of the intestines which are nervous complications of a well-marked and decided enteritis, the coarse diet and forced feeding will rarely succeed. The diet will need to be blander and less irritating in all cases in which an inflamed condition of the mucosa is a prominent feature, though there are doubtless numerous cases in which, while there exists a true enteritis, it is mild, recent, and a result merely of the irritation produced by retained masses of hardened feces, and in these whatever diet or other remedies will best overcome the constipation may prove effective for the cure of the entire symptom-complex. When there is a chronically inflamed mucosa of a stubborn character, complicated by mucous colic, you will need to rely upon the very carefully regulated diet advised for chronic enteritis in Lecture LXVI., and combat the constipation or diarrhea by the therapeutic measures recommended in the lectures upon those subjects. Nearly always there will be constipation, and the most successful single remedy for it will usually be olive, linseed, or cotton-seed oil, injected at bedtime in doses of one to eight ounces and retained till morning. When more decided laxative drugs are needed, cascara sagrada, sulphur, senna, dandelion, or tamarinds in the smallest doses that will empty the lower bowel every day without liquefying the stools will succeed best. A complete or partial rest cure will prove the most effectual remedy for the neurotic symptoms, including the excessive secretion of mucus and accompanying pain, and should be supplemented by electricity—especially general faradization or some of the static modalities

for their systemic effect, and large doses of galvanism for their local alterative effect upon the diseased intestinal mucosa as described in Lecture LXVI. (See also Lectures XXV., XXVI., and XXVII.) Massage of the body generally is indispensable as passive exercise for the patients who are in bed, but in the presence of spastic complications, such as are almost invariably associated with colica mucosa, there should be no deep kneading or other irritating procedures over the abdomen. Light stroking or surface friction will be all the manipulations which can then exert a favorable action in that region.

In this connection it should be again emphasized as strongly as possible that all neurasthenic patients, including those suffering from colica mucosa, whether with or without a pronounced enteritis, need to have rest, partial or complete, plenty of sleep, and at least an adequate supply of nourishing food to maintain nutrition at its proper level.

LECTURE LXXIV

EXCESSIVE ERUCTATIONS AND GASTRO- INTESTINAL FLATULENCY IN GENERAL

FLATULENCY, or the eructation of gases from the stomach, is the most common of all gastric symptoms in the various conditions usually grouped under the vague term, indigestion or dyspepsia. And those who have made a special study of the numerous diseases of the digestive system, from the standpoint of ætiology and pathology, should be prepared to discuss them from the clinical side as well. Such an important and obtrusive symptom as flatulency needs to be elucidated and traced to its possible causes in language easily intelligible to every practitioner of medicine. Gases eructated from the stomach most often result from fermentation or putrefaction somewhere in the alimentary tract. The small quantities that may be swallowed ordinarily, and the little carbonic dioxide taken sometimes with effervescent drinks or disengaged from the carbonates, are not important; and the rare cases generally classed under the head of nervous eructations are only the exceptions which prove the rule. In twenty-six years of practice, I have seen two or three such cases, one of which was at Ewald's clinic in Berlin.

Numerous cases of digestive disorders characterized by much flatulency have been under my observation at times during recent years. Even a cursory study of these has proved very interesting. Full detailed reports and an exhaustive analysis of them must be omitted; but an attempt has been made to classify them according to their causes, relations, and complications. They include cases of (1) fermentation of the starch foods, due to either hyperchlorhydria or acid gastric

catarrh (gastritis sthenica), and complicated nearly always with more or less chronic intestinal catarrh; (2) chronic asthenic catarrh of the stomach (gastritis asthenica); (3) muscular atony of the stomach (myasthenia gastrica), with or without dilatation or prolapse (gastroptosis), but always with delayed emptying and resulting stagnation of the stomach contents; (4) pyloric obstruction, with stagnation or retention resulting from one of numerous obstructive causes, such as tumors, scars of ulcers, stenosing gastritis, adhesions to adjacent organs, spasm of the pylorus in severe hyperchlorhydria, or the pressure of a prolapsed right kidney upon the duodenum; (5) nervous dyspepsia (neurasthenia gastrica); (6) intestinal indigestion; (7) chronic intestinal catarrh (enteritis chronica) without gastritis; (8) chronic catarrh of the appendix vermiformis (appendicitis catarrhalis chronica), with usually also some involvement of other portions of the intestines in the same process; (9) chronic constipation from obstruction or other cause, apart from the above-named affections; and (10) fermentation in the stomach, dependent upon swallowing mucus and bacteria having their origin in the nose, naso-pharynx, and mouth, including carious teeth.

Very exceptionally, also, sufficient air may be swallowed to produce excessive eructations, but I have not for a number of years encountered a single case in which such a cause of eructations was to be suspected, or in which some more tangible cause could not be discovered.

There are probably still other causes of gaseous accumulations in the stomach which do not now occur to me; but, with two or three possible exceptions, I have never met with any cases of eructations which could not be accounted for as attributable to some one of the conditions above mentioned. I have not yet been able to convince myself that large quantities of gases are secreted directly by the cells of the stomach, as has been claimed by some authors.

Belched Gas often from the Intestines.—It is quite demonstrable, however, that the gases so copiously produced by fer-

mentation and putrefaction in the intestines of many dyspeptics easily invade the stomach through the pylorus. This may take place at any time when the pylorus is relaxed, but especially during digestion, while the chyme is passing into the duodenum. With the highly distended condition of the intestines in these patients, the pressure is great in every direction, and manifestly the pylorus must often be the point of least resistance, especially when the gut below is obstructed by accumulations of feces or by spasmodic contractions of its circular muscle. Most of the causes of flatulency given in the above classification are too obvious to require discussion. As to three of them, however, Nos. 1, 8, and 10, a few words may be in place.

Hyperchlorhydria, the most frequent cause of indigestion, according to Einhorn's view—which my experience fully confirms—greatly increases the fermentation of farinaceous foods in the stomach, besides being one of the most potent factors in the production of intestinal derangements, especially gas formation.

Chronic Appendicitis as a Source of Flatulency.—

Catarrh of the appendix, with more or less occlusion of its opening, constantly breeds and sends out into the cecum, from time to time, colonies of highly virulent colon bacilli as described by A. O. J. Kelly.¹ As a result, the colon is kept constantly or intermittently infected, and even after appropriate measures, such as abdominal massage and antiseptic colon douches, have cured the catarrhal process in the bowel, there is reinfection from the persisting catarrh in the appendix, and this probably often involves the small intestine. The virulent bacteria escaping frequently from the chronically diseased appendix would greatly increase fermentation and putrefaction in the intestinal contents, and, as explained above, the gaseous accumulations there may, at times, find a vent in the upward direction through the stomach.

One evidence that in cases of copious belching the gas may

¹ *Phila. Med. Jour.*, November 11, 18, and 25, 1899.

not come from the stomach but from the intestines, is an observation often made by me. In washing out the stomach of a catarrhal patient afflicted with excessive eructations, it would be noted that after completely emptying the viscus of all food remains and mucus, there would develop, coincidently with the opening of the pylorus to permit the escape of the portion of wash water retained, a spell of active and profuse belching. The stomach having been previously completely emptied, the gas brought up could only have come from the bowel through the pylorus when it opened for the escape of the wash water.

Infection of the Alimentary Tract from the Mouth, Nose, and Throat.—In catarrh of the upper air passages, or in any part of the oral cavity, myriads of germs, as well as mucus, are swallowed with the saliva frequently, and always washed down copiously by the food and drink. In the case of disease in or about the roots of the teeth, and especially when there are neglected dental cavities, the germs are liable to become very virulent as well as abundant. The swallowed mucus, once infected, is as good a culture medium as that produced *in situ*, and is not easily extruded from even a healthy stomach. Hunter¹ has shown that diseased mouths may produce a septic form of gastritis with serious secondary effects, going on even to pernicious anæmia in some cases, and I have recently seen a case in which purulent conditions around the teeth, long neglected, coexisted with gastric atrophy which had probably resulted from such a gastritis.

Reflex Causes of Flatulency.—Robert T. Morris, in a very suggestive paper on Intestinal Fermentation as it Interests the Surgeon,² refers to the rôle played by the displacements of the different abdominal viscera, and by adhesions between the latter and adjacent structures in the production of neuroses of the digestive system, including nervous dyspepsia, mucous colic, flatulent conditions, etc. Furthermore, he emphasizes anew his former observation that certain normal involution

¹ *Med. Press and Circular*, April 3, 1901.

² *Loc. cit.*

changes in the appendix vermiformis, which result in the replacement of the lymphoid and mucous layers with connective tissue, cause irritation of the terminal nerve filaments to such

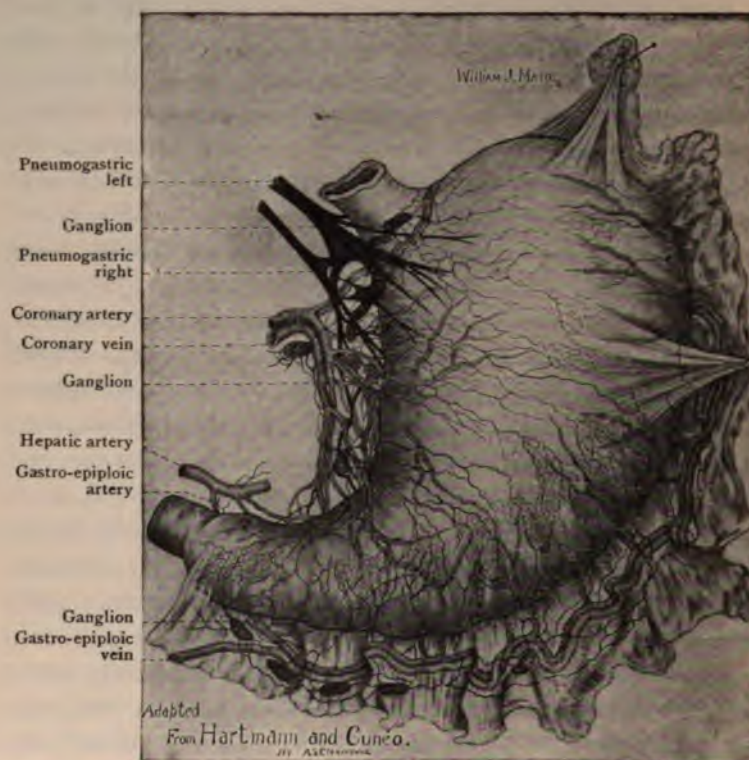


FIG. 98.—The nerves, blood vessels, and lymphatics of the stomach.
(By permission of Dr. W. J. Mayo.)

an extent as to set up a train of symptoms generally classified as intestinal fermentation.

Morris adds also a strong indorsement of Dr. George M. Gould's view regarding the importance of ocular defects as a cause of these neuroses, testifying that "a very large group of cases of intestinal fermentation is dependent upon eye-strain." He states further on this head: "The ones that I see are sent to the office most often with the request to have the appendix

examined because the distention of the cecum is apt to cause more pain than distention of other parts of the bowel, and attention is attracted to this region. If there are external evidences of eye-strain, these cases are referred to the ophthalmologist along with my cases of 'nervous dyspepsia' and 'gastric neuralgia,' and some of the most brilliant results that I have observed in any kind of medical practice have come out of the treatment that was instituted."

The exceeding richness of the nerve supply of the stomach is shown clearly by the accompanying illustration, Fig. 98. The numerous branches of the vagi and of the ganglionic nervous system ramify to every part of the viscus. No wonder it is so often disturbed reflexly, and so frequently, on the other hand, a cause of reflex derangements in other organs!

The Treatment.—The cause of the flatulency must, of course, first be sought for, and the therapeutic measures then be directed to the underlying pathologic state.

In fermentative conditions with chronic gastric catarrh, the diseased process needs to be combated persistently by lavage, diet, massage (in the asthenic cases), and often hydriatic procedures, as well as by HCl and bitter tonics for deficient, and alkalies and sedatives for excessive, gastric secretion, aided by all the practicable roborant measures, including a proper alternation of rest and exercise, and especially by those recreations that will keep the patients as much as possible out in the open air without unduly taxing their strength. The intragastric spray may be employed instead of lavage when the latter fails.

Intragastric electricity may be made very helpful in chronic gastric catarrh, and in deficient motor power of the gastric muscles; therefore, of course, in all the fermentative conditions resulting therefrom.

Antiseptic drugs have often proved disappointing in my hands, especially when administered by way of the mouth with the idea of controlling fermentation by a direct action. I have seen great good result from even small doses of HCl—2 to 10 drops of the officinal dilute acid in water after meals—

in cases of asthenic gastric catarrh with a deficient gastric juice, the secretion of HCl increasing, and the fermentation and flatulency being often lessened or stopped, but this gain has seemed to result mainly from a restorative action upon the gastric glands. Furthermore, I have seen in like cases, as well as in others with fermentation dependent merely upon diminished secretion of HCl, marked improvement gradually result from one to two drops of carbolic acid or creosote, or even smaller doses, the improvement coinciding with a gain in the amount and quality of the gastric juice. In both the usual forms of gastric catarrh—whether the HCl be increased or diminished—bismuth, in doses of 5 to 50 grains after meals, has often effected brilliant results, especially in the higher range of doses when combined with alkalis, a milk diet, and absolute rest, in cases of hyperchlorhydria with ulcer, accompanied by much fermentation of starch foods; but here the good result doubtless comes more from its mechanical soothing and absorptive effect than from its antiseptic action. Evidence is accumulating, also, as to the efficacy of some of the newer combinations of bismuth, particularly betanaphthol-bismuth (orphenol) and tribromophenol-bismuth (xeroform), but the internal use of these should be limited to cases in which there is no tendency to an excessive secretion of HCl.

In cases following operations in the abdomen, and in all others in which there is reason to suspect peritoneal adhesions, surgical aid should be summoned; so also when there are displacements which have not yielded to other suitable treatment. As in all gastro-intestinal cases, you should carefully see to it that any ocular faults have been properly corrected.

The diet appropriate to chronic gastro-intestinal catarrhs and the fermentation dependent upon them I have discussed at length in the lectures devoted to the subject of diet in general. It is unnecessary to say more here than that it is not safe to attempt to follow strictly any general rules, since there are so many exceptions. Every case must be studied by itself. I might venture the statement, however, that in the true catar-

rhral cases much restriction is usually necessary, especially as to the carbohydrates, while in nervous dyspepsia patients often eat too little.

It is most unscientific and often very harmful to attack the flatulence symptomatically by means of irritant antiseptics which would aggravate an unsuspected hyperchlorhydria, and perhaps bring on a fatal gastric or duodenal ulcer. And it would be equally disastrous to treat a debilitated, underfed neurasthenic, suffering from nervous dyspepsia, by low diet and stomach washing.

When the fermentation and eructation do not depend upon catarrhal inflammation in either the stomach or small intestine there is usually gastric atony or dilatation, the treatment for which must be carried out as described in the lecture devoted to that subject, and at the same time lavage with antiseptic solutions as advised for asthenic gastric catarrh may often be practiced with advantage every day, or every other day, to cleanse away fermenting food remains. The diet should, for a few weeks at least, contain as little of the more fermentative carbohydrates as possible.

In the cases of nervous eructation, the treatment, in addition to electricity locally, should be that appropriate to the neurasthenia or hysteria upon which the affection depends.

Intragastric applications of the induced electric current (faradism), in connection with cold water locally, regulated physical exercise in the open air, abundant sleep, and all the other measures required for neurasthenia, will rarely fail in these cases, when the eructations do not result from some real lesion, but you should always examine closely into the condition of the intestinal mucosa, where will frequently be found a catarrhal inflammation which has caused both the excessive upward rush of gas and the associated so-called neurosis.

In the section on meteorism, etc., under the head of Intestinal Neuroses, in Lecture LXXVIII., I have discussed with sufficient fullness the subject of excessive flatulency in the intestines in all its forms, whether of nervous or other origin.

LECTURE LXXV

GASTRIC NEUROSES, SECRETORY AND SENSORY

MOST of the gastric affections having no known anatomic basis are assumed to be of nervous origin, and as to a certain proportion of them, this is probably correct. I shall, therefore, follow the example of the majority of authors in devoting considerable attention to the so-called neuroses of the stomach and intestines. They shall be discussed under the three heads, secretory, sensory, and motor, though they are more frequently considered in the reverse order. It is my belief that the excessive acid secretion—hyperchlorhydria—which I have found to be the most prevalent of all gastric derangements, and some degree of gastric hyperæsthesia, which frequently occurs, are the chief causes of the common motor disturbances, such as spasms of the cardia and pylorus, cramps or colics of the stomach, etc. Hence it seems to me appropriate to take up the derangements of secretion first, those of sensation next, and those of motility last.

The Nervous Secretory Derangements of the Stomach.—

The derangements of gastric secretion dependent upon inflammatory conditions have been considered already under the heads of Asthenic and Sthenic Gastritis. Excessive Secretion of the Gastric Juice, etc., is the title of another lecture (LI.), in which I have discussed Hyperchlorhydria, Reichmann's Disease, and Gastroxynsis, forms of hypersecretion which are due probably, in some cases, to obscure nervous conditions, and in others to reflex causes. In Lecture XLIX., especially, on Chronic Sthenic Gastritis, excessive secretion is fully discussed. There is little left to be said about derange-

ments of secretion, which are supposed to be of purely neural origin. They have no pathology, their ætiology is obscure, their symptoms are virtually the same as those of the other forms of abnormal HCl secretion, and the treatment of them must be along the same lines. Whether the secretion is excessive, as is most usual in nervous conditions, or deficient, the chief difference in the therapeutic measures applicable is that, the affection being a complication or direct result of neurasthenia, the measures suitable for that disease must supplement the other usual remedies for the deranged secretion. Further on, in Lecture LXXVII., devoted to the subject of Nervous Dyspepsia (Neurasthenia Gastro-Intestinalis), the treatment of this condition will be found somewhat fully considered. Rest, both physical and psychic, as well as all the practicable strengthening measures, are still more important than in the other forms of HCl excess.

Nervous Hypochlorhydria or Gastric Subacidity.—You will encounter many cases in practice showing all possible degrees of HCl deficiency, and in quite a proportion of them no other cause than some nerve derangement can be found. If, after having performed your whole duty in respect of thorough examinations to exclude any other possible lesion, you find no tangible cause except neurasthenia, your proper course will be to build up the system in every practicable way as directed for the management of the nervous forms of hyperacidity, and in addition, to administer small or moderate doses of HCl, with usually pepsin as well, unless the tests have shown a sufficient amount of the latter. But do not prescribe these until, after several examinations, you have become convinced that the deficiency of HCl is more than a passing one, to be followed in a few days by a normal or excessive proportion of it. Even then, do not continue such remedies at first beyond one week without testing again, for in such neurasthenic cases, the glands are usually very impressionable and may suddenly respond to the stimulation of the HCl and pepsin by a hypersecretion, which is likely to be more injurious, if it per-

sists, than the deficiency would be. Indeed, if, for any reason tests of the stomach contents cannot be made at least every week or ten days at first during such a course of treatment, it will be wisest to refrain from prescribing HCl altogether, and depend upon the bitter tonics, especially nux vomica, quassia, and a general roborant treatment.

Hyperchlorhydria Mistaken for Hypochlorhydria with a Serious Result.—The point above made is well illustrated by the following case report:

M. K., aged thirty-five, a stenographer of delicate nervous temperament, has come to me while I have been writing this lecture and gives the following history: Six weeks ago, after a spell of unusual physical weakness, she began to suffer from a hot and uncomfortable feeling in the stomach, coming on an hour or two after eating and persisting often for several hours. She consulted an irregular practitioner, who prescribed tonics, including HCl. The discomfort then steadily increased, and by the end of two weeks later had developed into such severe pain that she was directed to remain in bed and limit herself to liquid diet, to consist of beef tea and milk. The acid was continued some time longer, without the other tonics. Later the diagnosis of gastric ulcer was made, and the acid medication changed to small doses of an alkaline one, but meat extractives were still allowed as part of the diet. No tests of the stomach contents were made. The patient is now able to be about, but still suffers pain after eating, especially after solid food.

Examination at my office revealed the usual marked tender spots characteristic of gastric ulcer, and this being still so recent a development I decided to delay, for the present, the introduction of a tube for the purpose of getting a sample of the stomach contents. Excluding meat and meat extracts or broths from the diet entirely, and limiting her to milk and Plasmon, at the same time administering alkalies in larger doses, together with full doses of bismuth, have relieved the painful symptoms already within a few days. The patient has meanwhile been kept strictly in bed. If the relief had not been so prompt from this régime, I should have prescribed rectal feeding for a week or ten days.

This patient at first, doubtless, had merely an acid form of dyspepsia, *i. e.*, hyperchlorhydria, instead of hypochlorhydria as the physician supposed. If he had established this fact by a stomach test, and instead of hydrochloric acid and meat extractives (the two most powerful stimulants of the gastric glands), had prescribed alkalies, belladonna, and a very bland unstimulating diet, the patient would have been spared weeks of suffering, to say nothing of the loss of income through an illness which has already detained her from her occupation nearly two months, and will probably prevent her resuming it for another month or two, even if she should be fortunate enough not to require a laparotomy to bring about a final cure.

Nervous Anacidity of the Stomach—Achyilia Gastrica.—Ewald, sixteen years ago, called attention prominently to the fact that, even in the absence of any discoverable disease, there may be a total lack of gastric secretion for long periods of time. In the first edition of his "Diseases of the Stomach" under the head of The Practical Value of the Modern Chemical Tests, he referred to a series of cases examined by Dr. Wolff and himself, concerning which he says: "To our great astonishment we found a permanent absence of free HCl in a number of persons without the slightest stomach complaints." He named this condition Anadenia Gastrica.

Einhorn has since studied the same subject, recording many similar cases, and the name Achyilia Gastrica, by which he designated it, has been generally accepted as an appropriate one.

The symptoms of achyilia gastrica depend upon the cause. Of course when there exists a true atrophy of the glands there is likely to be much impairment of the health with anæmia, debility, etc., from a lack of nutrition; but only when, at the same time, there is a failure of the intestinal digestion, or what would amount to the same thing, a lack of propulsive power in the stomach so that its contents cannot be extruded into the duodenum within any reasonable time. It is rare, however, that a failure of gastric motility coincides with atrophy.

Certain writers have assumed that achylia, or rather a complete atrophy of the gastric glands, is the most frequent cause of pernicious anaemia; but this theory has not been proved. I have seen several cases of achylia in which the patient was well nourished and complained of no indigestion, except after some marked imprudence in eating or drinking. Achylia is itself only a symptom—the absence of gastric secretion—and may be associated with various diseases, or be found in conditions of apparent health.

The diagnosis can only be made from a test of the stomach contents, and finding not merely a total absence of HCl, both free and combined, but also of the rennet ferment and its xymogen as well as the inability of the gastric juice to digest albumin even when 0.2 per cent. of HCl has been added to the mixture, showing thus absence of pepsin. The total acidity will not be over 10 or 12 in a case in which the failure of secretion is complete, and is often less.

The treatment must be directed to the primary disease, whatever that may be. When it is neurasthenia, the remedies advised in Lecture LXXVII., on Nervous Dyspepsia (Gastro-Intestinal Neurasthenia), may be hopefully followed, and in addition it is often well to add a mixture containing small or moderate doses of dilute HCl combined with some efficient preparation of pepsin.

I have observed numerous cases in which for months or even years at a time there was an absence of all the elements of the gastric juice, and yet finally a moderate secretion was re-established as a result of such a course of treatment. In a large proportion of these it is highly probable that the suppression of the secretion was due to some nerve fault; but in one of them, at least, the cause was doubtless the prolonged administration of bicarbonate of sodium. By the advice of a physician who did not make a practice of testing the stomach contents, this patient, a lady aged about thirty, took regularly moderate doses of the soda preparation daily for a period of several years, both in this country and during an absence in

Europe, and when she came under my care, there was neither free nor combined HCl and no rennet ferment. She took by my advice HCl and pepsin for some eight months before the secretion was fully restored. In several cases of achylia in elderly persons, I had reason to believe that there was atrophy of the glands, and in some of them this diagnosis was confirmed by the failure of even HCl and pepsin persevered with for several years (because of their good effects in a palliative way) to restore the secretion. In others again, in which the achylia may have been due to nervous causes alone, there was finally a return of the secretion under the course of treatment which included 5 to 10 minims of dilute HCl with 15 to 30 minims of a good glycerol of pepsin after each meal, along with a generally tonic regimen.

In cases of *undoubted atrophy* it is not, as a rule, useful to administer HCl as a remedy. Better results have usually, in my experience, followed the abandonment of all attempts to re-establish the gastric secretion and the prescription of full doses of an active preparation of pancreas; but whenever there is the slightest doubt on this point, I believe it is well to push the administration of small doses of the HCl with pepsin at intervals, if not persistently, for at least one year, provided it agrees well, since after an even longer time than this the secretion has sometimes returned. Cases are on record in which there has been a restoration of the secretion after as long a time as five years, but in these cases HCl could not have been administered perseveringly as a remedy, since it is unquestionably the most powerful stimulant we have for the gastric glands, so effective, indeed, that if it is to bring back the secretion at all, this result could scarcely be postponed so long.

SENSORY DISTURBANCES OF THE STOMACH: GASTRALGIA, GASTRIC HYPERÆSTHESIA, ETC.

True gastralgia or neuralgia of the stomach is not very often encountered. You will likely see many more cases of acute gastric pain due to hyperchlorhydria, at least an equal

number attributable to spasm of the pylorus or gastric cramps, and nearly as many in which the cause is ulcer or cancer.

The name *gastralgia* should be applied to those acute stomach pains only which occur paroxysmally without regard to the character or amount of food taken, and are caused by a true affection of the nerves of the stomach, or of the centers from which they arise, and not to any of the numerous similar pains which may result from a diseased condition of some of the other structures of the viscus.

The Ætiology of Gastralgia.—The affection can arise from any of the causes that are likely to produce neuralgia in nerves elsewhere. These include malaria, syphilis, gout, anæmia, hysteria, neurasthenia, and systemic poisoning by tobacco, lead, mercury, or other of the metals. According to some authors the pains that may be produced in the stomach by perigastritis and organic diseases of the stomach itself, as well as by the reflex gastric pains from displacements of any of the viscera or various diseases in distant parts as in the genito-urinary organs of either sex, etc., are classed among the *gastralgias*; but I cannot see that any useful purpose is subserved by giving to the word *gastralgia* so broad a significance. Call the other gastric pains of obscure origin by the name of *gastrodynia* if you will, but let us keep the word *gastralgia* to describe a true neuralgia of the stomach nerves. Various diseases of the central nervous system can produce *gastralgia*. Cerebral affections are exceptionally the cause of it, but those of the spinal cord more often, including certain forms of myelitis, and *tabes dorsalis* produces a comparatively frequent manifestation of *gastralgia*, known familiarly as *gastric crises*.

The symptoms of Gastralgia are much the same as those of other forms of neuralgia. The pain comes on in paroxysms lasting from half an hour to several hours, and is generally severe, often intolerable, so that relief by hypodermics of morphine is urgently demanded. It may be shooting, boring, tearing, or burning in character. Unlike most other gastric pains

it is usually relieved, to some extent at least, by firm pressure upon the epigastrium. It may radiate in any direction, but especially toward the spine or downward into the hypochondria. Attacks of gastralgia do not recur with any regularity, nor can they often be traced to any special provocation, though sometimes mental strain or excitement precedes them. In the severer ones the patient not only suffers acutely, but may experience a sense of exhaustion and extreme depression which awaken the fear that death is impending. The face is contorted, the countenance expressing great suffering, and cold sweat may appear upon the skin.

The diagnosis of Gastralgia is not always easy, and can often be made only by exclusion. In the absence of the symptoms and signs of ulcer, chemical findings showing hyperchlorhydria or other form of HCl excess, paroxysms of violent pain in the stomach occurring irregularly, independently of the digestive periods, and leaving the patient entirely free of any discomfort in the intervals, may be set down as probably due to gastralgia. Carcinoma of the stomach may possibly produce spells of similar pain, but is much less likely to do so than the other affections named, and there would not then, as a rule, be such entire freedom from discomfort between times. Gall stones cause extremely violent pains in the region of the gall bladder, and may sometimes be confounded with gastralgia, but the pains are referred to a point much further to the right than those of gastralgia and are not relieved in the least by pressure. Moreover they are nearly always accompanied by symptoms of obstruction of the bile duct—jaundice, high-colored urine, pale clay-colored stools—and usually also by a swelling in the region of the gall bladder, as well as by more or less fever, though this may often be wanting. Atypical cases of biliary colic may be impossible to differentiate from gastralgia, and you must then decide by the results of the treatment for the former. The diagnosis from hyperchlorhydria, ulcer, and cancer will readily be made by comparing the symptoms and signs of those diseases as described in

previous lectures. In hyperchlorhydria the pain is relieved by more food; in ulcer, increased by food; but in gastralgia, has no relation at all to food. Muscular rheumatism could scarcely be confounded with gastralgia, since the pain is not paroxysmal nor violent. Intercostal neuralgia may cause a similar kind of pain, but in such cases the affected nerve will be sensitive to superficial pressure, not only at the locality where the pain is felt, but usually at various points all the way around to its spinal origin. The diagnosis from any of the conditions involving excessive secretion of HCl with the acute pains and motor spasms frequently resulting therefrom, can easily be determined by examinations of the gastric juice, repeated if necessary. When for any reason these cannot be made, the makeshifts for determining otherwise approximately the proportion of HCl in the gastric juice may be resorted to, and will sometimes help you to decide. (See Lecture IX.) Then, too, the regular recurrence of the pain at the height of digestion; relieved by taking more food and passing off entirely as a rule when the digestion has ended, presents a picture in hyperchlorhydria and allied conditions, totally different from that I have just shown you as characteristic of gastralgia. The cramp pains occurring in pyloric spasm usually persist till the stomach has been emptied either through the pylorus, or by vomiting, and recur after the next full meal.

Treatment of Gastralgia.—Your chief object in this respect should be to ascertain as certainly as possible the nature of the primary disease, and then so shape the treatment as to remove or control it. When the attacks are of unusual severity, the pain must of course be relieved in some way—by the administration of morphine—even hypodermically, if necessary; but, if possible, other less harmful remedies should be first tried. A turpentine stupe or hot mush poultice will generally lessen the pain decidedly, or what is often just as effective and not nearly so troublesome is a very hot, wet compress, applied so hot that a layer or two of flannel will need to be placed between it and the patient. The whole should then be covered

by three or four thicknesses of cloth, including, if practicable, one layer of some impervious material so as to confine the moisture and prevent evaporation or a too rapid cooling. Such an application, fastened firmly to the abdomen by a binder passing all the way around the body, will often control an attack of even very severe gastralgia or other abdominal pain as effectually almost as an opiate, without any of the unpleasant effects of the latter. When morphine must be injected, it is best to combine with each $\frac{1}{4}$ grain of the latter 1-100 to 1-80 grain of atropine sulphate, since the combination is likely to disturb the stomach very much less than would morphine alone, and is also more powerfully antispasmodic.

The systemic treatment to be pursued between the attacks, depends, of course, very much upon the character of the primary disease. When this has resulted from any specific infection, such as malaria, quinine is naturally the very best remedy of all, and it has even been found effective in other forms of gastralgia in which there has been no suspicion of malaria. Syphilis and the metallic poisons call for potassium iodide in full doses. Lithæmia or obscure forms of gout demand alkalies and deobstruents with more exercise and less rich food. Anæmia, chlorosis, and the other depressed conditions including neurasthenia and hysteria are benefited by iron, arsenic, and often by phosphorus, the hypophosphites or the glycerophosphates. All the other tonic or building-up measures, such as country, mountain, or seashore air (especially the last, which often acts almost magically), well-selected hydropathic procedures, and above all, electricity, are particularly indicated in these latter classes of cases. Full doses of galvanism (20 to 30 ma.) applied directly through the region of the stomach from the back to the front with the positive pole over the epigastrium, and repeated every other day at least, or better yet, half these doses applied intragastrically, will usually prove effective, and sometimes will even relieve the paroxysms of pain. For the latter, too, the new method by mechanical vibration, applied with moderate pres-

sure directly over the seat of pain, is well worth a trial in such cases, since it often proves effective in relieving neuralgic pains, both when applied over the site of the pain and upon that part of the spine from which the structure involved receives its nerve supply. The static sparks and electrostatic currents are often effective here also.

When the pain is a reflex from disease in the genito-urinary system, or in any other distant organ, the affected part must receive the chief attention, and naturally any local disease or unhygienic practices which are keeping up irritation must be corrected.

Gastric Hyperæsthesia.—In many diseases of the stomach, especially in the different forms of gastric catarrh, in hyperchlorhydria, etc., pain or discomfort is experienced in the viscus, and the sensory nerve terminals are believed in such cases to be unduly sensitive. There is certainly a wide difference between the complaints of abnormal sensations in some severe cases of the kinds mentioned, and those made by the patients in other like conditions of a far milder degree—not that the complaints in the former are greater, as you would naturally expect them to be, but often markedly less. For example, I exceptionally encounter cases of acid gastritis with a percentage of free HCl above 0.2 without any symptoms whatever, and then sometimes see cases in which there is only a very slight catarrhal process and a percentage of free HCl not over 0.09 per cent., with complaints of burning or other markedly disagreeable sensations during the height of the period of digestion. Again, in consequence of a long-standing chronic atrophic catarrh, with virtually no gastric juice left in certain cases, there will be complaints of burning sensations after the administration of very moderate doses of HCl, unless it is largely diluted and sipped slowly during the course of an hour or two. Indeed, I have most frequently encountered such a manifest hyperæsthesia, against acids especially, in cases in which there has been complete achylia.

Yet, if we were to accept the view of gastric hyperæsthesia

given by Riegel, all such instances of the condition as are above described would have to be excluded entirely. After accurately defining this affection as "a morbidly increased sensibility of the sensory nerves of the stomach," he goes on to say: "Hyperæsthesia is characterized by a variety of abnormal sensations—a feeling of pressure, fullness, tension, burning, boring, etc., during digestion. As a rule, these sensations persist for some time after digestion. Abnormal sensations of the kind are encountered in the majority of organic diseases of the stomach. These of course we are not discussing in this place. The same abnormal sensations are occasionally seen as complications or symptoms of hysteria, neurasthenia, and a number of diseases of the central nervous system. In anæmia and chlorosis we also occasionally encounter hyperæsthesia. In the latter cases we are by no means justified, however, in declaring the hyperæsthesia to be a true neurosis of the stomach, for we may only diagnose this condition if the stomach is intact, and in chlorosis and anæmia, as we know, we frequently see perversions of gastric secretion, in particular hyperchlorhydria, so that the latter alone may be made responsible for the abnormal sensations, and may even produce attacks of cardialgia."

Accepting Riegel's definition of gastric hyperæsthesia, "a morbidly increased sensibility of the sensory nerves of the stomach," and it cannot well be improved, it seems logical to include under it all the cases of unduly heightened sensibility of the gastric nerve endings, in which comparatively trivial causes produce an exaggerated amount of sensation, in spite of the fact that there is an associated organic lesion. It is well known and admitted by Riegel himself, elsewhere in his great work on the stomach, that, in a large proportion of the gastric affections which we usually class as nervous, there exists some real lesion which by our present methods we are unable to discover, but even admitting that there may be cases of hyperæsthesia dependent wholly upon a fault in the nerves themselves, whether it be in a nerve center, trunk, or ter-

minal, we need some term to describe also the numerous symptom groups in which, along with a relatively slight lesion, there is an altogether exaggerated sensibility of the nerves.

The diagnosis of gastric hyperæsthesia is made from the single symptom that with either no determinable gastric lesion, or one of slight or moderate character, there are complaints of discomfort or pain after eating, which is apparently causeless, or, if disease be found, out of proportion to the amount of such disease. There is usually some sensitiveness on pressure over all that part of the stomach which is below the ribs, but this is not marked anywhere, and there is lacking especially the acute tenderness over circumscribed spots demonstrable in ulcer. Though considered by some to be closely related to gastralgia, it should be easily differentiated from the latter by the uniform dependence of the pain upon eating, while gastralgia may come on in paroxysms at any time, regardless of meals. Besides, the pain in the latter affection is often intense, severe, while that of hyperæsthesia is usually slight—often not more than a decided discomfort. It might be confounded with the dull pain and tenderness often seen in chronic gastritis if no examination of the stomach contents could be made, but the findings, chemic and microscopic, in such an examination would reveal the true condition.

Treatment of hyperæsthesia should be based mainly upon the nervous element which is always present. Galvanism from the spine to the epigastrium, with a short application additionally to the vagi in the neck, rarely fails to accomplish much. Galvanism or high-tension faradism applied within the stomach, by means of the intragastric electrode, is still better for all except the very few who are intolerant of any instrument in that viscus.

Spraying with a weak nitrate of silver solution (0.1 per cent.), or a menthol solution, and in stubborn cases with a combination of menthol and cocaine, is generally effective. Hot

compresses, as advised for gastralgia, may be kept on continuously at night with advantage.

The following prescription has often proved very helpful to my patients suffering from this affection:

Argent. nitrat.	} aa.....	gr. iv
Ext. nuc. vomic.		
Ext. belladon.		gr. i
Ext. taraxaci.....		ʒi.—ʒii
Bismuth subnit.....		ʒi
M. et ft. mass. in pil. No. XX dividend.		
Sig. One before each meal.		

In addition to the above-mentioned local remedies, the medicines and measures described in Lecture LXXVII. as suitable for nervous dyspepsia (gastro-intestinal neurasthenia) are indicated in gastric hyperæsthesia. Like the neuroses of the stomach, generally, it might be considered under the head of nervous dyspepsia, but there are reasons already stated for giving to some of them separate consideration.

Other Abnormal Sensations in the Stomach.—In health one does not have any sensations in the stomach except the pleasurable one of a comfortable satiety after a full meal. In various diseased conditions, especially in neurasthenia, whether there be any pathologic change in the organ or not, unpleasant sensations of one kind or another are frequently experienced. In addition to the various degrees of pain in the stomach described under the heads of Gastralgia and Gastric Hyperæsthesia, and to the pains arising from pathologic states, a symptom frequently described by patients is a *feeling of weight* or heaviness coming on regularly after eating. This is probably almost invariably due to atony of the stomach walls, whether associated with dilatation of the viscus or not; but it is claimed by some authors that the same sensation is sometimes encountered as the result of a neurosis merely, and I therefore mention it in this connection, though doubtful whether it ever occurs when the gastric motility is entirely normal. Other abnormal sensations which may undoubtedly be of nervous origin are a *feeling of heat or cold* in the stom-

ach after eating, and especially *nausea*. The latter symptom I have seen so often in women quite independently of any demonstrable gastric lesion that I am convinced it very frequently depends upon a reflex cause, the real lesion being most frequently in the sexual organs, particularly in women (who nearly monopolize the symptoms), or else upon a pure neurosis.

Nausea of such a reflex or nervous type never yields to any medicine addressed to the stomach. In a number of women patients afflicted at times with this trouble, I have found the cause to be an irritation of the uterus or ovaries, and it is always much aggravated at the menstrual periods. In some of these cases the particular fault has been a backward displacement which, failing the patient's consent to a curative operation, the gynecologist has tried to keep in place without a pessary, and with only partial success. The bromides will sometimes relieve temporarily, but all drugs may fail till the cause has been removed. Tonic measures and medicines are usually indicated, as in all the neuroses.

Hemicrania or migraine and intercostal neuralgia are other sensory disturbances which Fleiner has considered in this connection, because they are frequently dependent upon faulty stomach conditions. But, though these are often due to gastrointestinal disease, especially migraine, they are more appropriately considered elsewhere. They no more belong here than epilepsy, neurasthenia, eczema, etc., which often have a gastrointestinal cause.

DERANGEMENTS OF THE APPETITE

These may be due to organic lesions or to an excess or deficiency of the gastric juice, or be merely dependent upon a disturbed condition of sensation in the stomach. According to my experience, an abnormally large appetite has been most frequently seen in connection with either an increased secretion of HCl, or else with an excessive amount of the organic acids resulting from a catarrhal condition, or from a deficient

gastric motility; and anorexia has been rather constantly associated with a lack of secretion or motility or both, though exceptionally I have seen it coincide with hyperchlorhydria. But there are many cases which we must attribute to nervous causes.

Bulimia and Akoria.—Bulimia is an exaggerated or almost unappeasable hunger, sometimes called canine hunger. Akoria is a lack of the normal feeling of satiety after eating an abundant meal. The two conditions are closely allied, and when a person habitually eats far too much, it is often impossible to decide whether his excess in this respect is due to the one or the other fault. As a rule the two apparently go together, for it is exceedingly rare that one is impelled to go on eating after a feeling of fullness has been reached.

The term bulimia is commonly applied to an abnormally great appetite, one which is out of proportion to the demands of the system, regardless of the cause. Naturally the growing child and youth require more food than the full-grown adult, and the pregnant or nursing woman more than she who does not have to "eat for two." In like manner the convalescent from a fever or other serious disease has a normally increased appetite, and the man who works out in the open air for ten or twelve hours a day, as farmers and laborers often do, not to speak of soldiers on forced marches, needs two to three times the amount of food which will suffice for the idle indoor-dweller. In estimating whether the amount of food taken is excessive, these differences must always be taken into the account.

But when a person not in any one of the above-mentioned classes, who is not actively using his muscles for many hours daily, eats exceptionally large meals without feeling fully satisfied, or if, after a feeling of satiety, within an hour or so again experiences a sharp sensation of hunger which impels him to demand imperatively more food and drink, you may know that the appetite is an abnormal one and should take measures to remedy the diseased condition upon which it

depends. Most frequently this will be either a simple hyperchlorhydria, or some one of the various forms of excessive secretion of HCl, which you can, in most cases, easily determine by examining the gastric contents after a test meal. If such a hypersecretion be found, the appropriate treatment—alkalies, sedatives, intragastric electricity with the high-tension faradic current, etc.—will usually prove effective in curing the bulimia in the same degree that it succeeds in remedying the primary disease. When there is gastritis with either too much HCl or too little of the latter, but then with an excess of the organic acids which unduly irritate the gastric nerve endings and thus cause excessive hunger, the cure will be much helped by washing out the patient's stomach daily or every other day.

In other cases the excessive appetite may be due to worms or to diabetes, and then, of course, the first thing to do will be to treat by suitable measures these underlying diseases.

When, on the other hand, the bulimia is consequent upon some obscure nervous lesion, as in epilepsy, certain states of defective intelligence, or any fault of the nervous system, the task will be more difficult. In some of these cases a systematic limitation of the amounts of food to be taken is necessary, and all eating between meals must be strictly forbidden; the appetite can thus be gradually trained to correspond more nearly with the normal requirements. In stubborn cases it is advisable to apportion not only the kinds of food to be eaten, but precisely the amounts of each kind based upon the tables showing the number of calories or heat units required for a person not actively exercising and the normal proportions of proteids, fats, carbohydrates, and salts needed to maintain nutrition. (See Lecture XVI.) Meanwhile, of course, any discoverable fault or vice of the organism should be combated by appropriate measures.

The Buccal Reflex.—Horace Fletcher, a layman, who has made a more profound study of the appetite in relation to mastication, digestion, nutrition, etc., than most physicians,

maintains in a very interesting book recently published¹ that the majority of persons eat at least twice as much as they require, and claims to have discovered that the buccal reflex which should guide us in the length of time we chew our food, and the amounts eaten by us, has been lost or perverted in the case of most human beings. He holds that food should be masticated, or in the case of liquid, kept moving about in the mouth, till it has been so thoroughly insalivated as to become alkaline, when only, under normal conditions, the muscles about the fauces will open and permit it to be swallowed. As a result of hasty and excessive eating, with insufficient insalivation supplemented by drinking to wash down the imperfectly insalivated boluses, the natural buccal reflex is lost. To restore this lost reflex and prevent gluttonous eating, Fletcher advises systematic overmastication of every portion of food, solid or liquid, taken into the mouth, the attention being meanwhile concentrated upon the act, and claims that if this be practiced faithfully for from four to six weeks, the lost reflex will be regained, after which there will be neither appetite for more food than the body requires, nor the ability to swallow (without forcing it) any morsel that has not been properly masticated and insalivated.

The Proper Food Ration.—Fletcher is an American who has been carrying out scientific investigations and experiments upon this subject in Venice (Italy), and Cambridge University (England), as well as at Yale University (New Haven), in cooperation with a number of prominent physiologic chemists and other medical men. The results demonstrated by these experiments, particularly the smallness of the amount of food which could be made to maintain a complete nutritive equilibrium, when overmastication as advised by Fletcher was practiced, are described in Lecture XVI., on Prophylaxis, etc. They are very striking and exceedingly interesting. Fletcher refers also to a similar experiment as to the proper food ration

¹ "The A B-Z of Our Own Nutrition," New York, Frederick A. Stokes Co., 1903.

recently undertaken at Yale University under the auspices of the United States Government, a number of enlisted members of the Hospital Corps, who volunteered for the purpose, being the subjects.

These experiments are highly important, since the conclusions of Voit and others, as to the normal food requirements of man, have not finally settled the question.

Anorexia and Hyperkoria.—Anorexia is a lack of appetite, and hyperkoria, the opposite of akoria, is the coming on of a feeling of fullness or satiety too soon—after the ingestion of an insufficient quantity of food. As in the opposite conditions, these are often associated, and it may be impossible to tell which predominates in some cases when too little nourishment is regularly taken.

Although we would naturally expect a deficient appetite and deficient gastric secretion to go together, we by no means always find them so. While, as a rule, a lack of gastric juice is accompanied by a lack of appetite, I have seen many cases in which the appetite has been good in spite of a persistent achylia gastrica. So, too, anorexia is generally accompanied by a deficient secretion of the gastric juice, but by no means always. There are many depressed nervous or psychic conditions in which the patient runs down in health from insufficient food, or can only with great difficulty be induced to eat enough to maintain nutrition, in spite of the fact that the gastric secretion is sufficient. I believe, however, that an examination of the stomach contents in all the cases of nervous anorexia would show that in most of them the HCl and ferments are almost constantly much below normal, though the frequent improvement of such cases, under remedies addressed to the nervous system or mental state alone, might seem to prove the contrary. In these cases both the deficient secretion and deficient appetite are results of the systemic depression, and when this is removed by whatever cause, both the secretory fault and the consequent anorexia are overcome.

In addition to the faults in the stomach itself, such as a

lack of secretion, lowered motility, chronic gastric catarrh, and cancer, various systemic affections, such as, *e. g.*, tuberculosis and many other diseases, tend to decrease the appetite. Anorexia is often a consequence, too, of certain little understood nervous conditions. As already mentioned, psychic depression from whatever cause may take away all appetite. Grief, worry, anxiety, the fear of pain, and merely overstrain with the resulting profound debility and neurasthenia are quite capable of setting up the condition.

The symptoms of nervous anorexia are a marked distaste for food and a steadily increasing debility and emaciation in the absence of any organic affection capable of producing such a lowering of the health.

The diagnosis is equally simple and would seem well-nigh unmistakable. When no real lesion is to be found, and the patient persistently refuses to take an adequate amount of food, the cause can only be nervous or psychic.

The treatment, which in the beginning, before the loss of nutrition has gone too far, is nearly always successful, consists, first of all, in imperatively requiring the patient to take more food. At the same time, every effort should be made to tempt the appetite with a variety of toothsome dishes, as well as to stimulate it by means of stomachics. For the latter purpose I have found a combination of the tincture of nux vomica, or of quassia, with pepsin and HCl the most effective of all the drugs at our command, especially for the great majority of cases in which the cause, whatever it may chance to have been, has lessened the secretion of the gastric juice at the same time that it has taken away the appetite. The majority of authors, it seems to me, have not given sufficient prominence to the very valuable part that HCl and pepsin, as natural remedies which imitate closely the principal elements of the gastric juice, are able to play in restoring appetite, the power to digest food, and finally, in many cases, the normal secretion of that juice itself.

When the mental depression is very marked, and the condi-

tion has existed so long that complete apathy has resulted, the danger to life is considerable, and forced feeding through a tube—gavage—is sometimes indispensable. In other cases the rest cure proves a most valuable means of restoring the normal state. In bad cases of the kind it is frequently quite useless to attempt to carry out a successful treatment at the patient's home. Treatment in some institution, or seclusion with a skilled nurse, is then the only alternative.

LECTURE LXXVI

THE MOTOR NEUROSES OF THE STOMACH

UNDER this head gastrologists have described numerous affections, the predominant feature of each of which is an abnormality of some one or more of the motor functions of the stomach. These include the following: irregular or over-persistent contractions (cramps or spasms) either of the gastric walls as a whole, or of the sphincter muscles of the cardia or pylorus, and insufficiency of the same with such direct consequences of insufficiency of the cardia as rumination, regurgitation, and perhaps some of the forms of nervous vomiting, as well as nervous belching, pyrosis, etc.; also hypermotility and nervous atony or hypomotility and hyperperistalsis (the peristaltic restlessness of Kussmaul).

Spasm of the Entire Stomach (Gastrospasm).—This condition occurs very much less frequently than cramp or spasm of the orifices. Indeed it is exceedingly rare. It may result probably from hyperacidity or from certain derangements in the nervous system of obscure origin.

The symptoms are acute crampy pain, and often a visible contraction of the stomach into a hard roundish tumor.

The treatment for the attack should be hot, wet, and emollient applications locally, such as a hot meal poultice or wet compress, with, if necessary, morphine or atropine or both, hypodermically. To combat the tendency employ the measures recommended for gastro-intestinal neurasthenia, under the head of Nervous Dyspepsia, with additionally galvanism or high-tension faradism locally, preferably with one pole within the stomach. The pneumogastric nerves in the neck, and the

fourth to the twelfth spinal nerves, should also be stimulated mildly at their origin by galvanism, or by vibration applied by a mechanical vibrator. (See Lectures XXV. and XXVII.)

Spasm of the Cardia.—This is a spasmodic contraction of the muscles which close the cardiac orifice. It is less frequent than spasm of the pylorus. It may be provoked by the introduction of a stomach tube, by any very hot or cold drinks, or by swallowing unmasticated morsels of hard or tough food. Cardiospasm may also result from overdistention of the stomach with swallowed air, or with gases formed within the viscus, the pylorus then being spasmodically closed at the same time; or from the irritation of an ulcer or cancer in the immediate vicinity of the cardia, whether in the stomach or lower end of the esophagus. Gastric hyperacidity or hyperæsthesia is less likely to be an efficient cause of spasm in this part of the stomach than in the pylorus. Doubtless cardiospasm is also sometimes a consequence of a nervous shock, hysteria, or neurasthenia,—then a pure neurosis.

Acute cardiospasm of purely neurosal origin may be recovered from very quickly, or may last a day or two, the attacks recurring meanwhile every time an attempt is made to swallow. When it depends upon some lesion in the vicinity of the cardia, aggravated by hysteria or neurasthenia, it may still possibly be controlled by appropriate treatment, but is likely then to be much more stubborn. The chronic neurosal form, when recent, is usually curable, but the longer the disease has lasted, the less amenable it is to treatment. When secondary to some other disease, the prognosis of the chronic form is that of the primary affection, provided it be treated sufficiently early. The condition sometimes persists for years and then becomes refractory, as a rule, to all therapeutic measures.

The symptoms of acute cardiospasm are occasional attacks of dysphagia—either difficulty in swallowing or complete inability to swallow from a spasm of the sphincter—and often a regurgitation of food before it has entered the stomach. The

food thus brought up contains neither HCl nor peptones, nor indeed any of the elements of the gastric juice or of the products of peptic digestion. The attempt to pass food through the orifice usually causes severe pain, such as is felt in cancer of the cardia, but in some chronic cases pain is wanting.

Acute spasm of the cardia is most likely to occur in nervous persons, and during a meal. It may then be merely transient, passing off in a few minutes, but usually recurs frequently in the course of the same meal, and may sometimes be persistent. In the more chronic form swallowing is less acutely painful, but it may be impossible to get any except liquid food into the stomach, and in the worst cases not even liquids will pass, except after dilatation with a sound or tube. In these cases feeding through a tube, or rectal feeding, may need to be resorted to for a time. The stomach then becomes much contracted, and it is generally held that the esophagus becomes dilated. Riegel doubts whether dilatation or diverticulum of the esophagus is not the cause, rather than a consequence, of the cardiospasm when both occur, but we know that an organic stricture, at or above the cardia, causes a pouching in the esophagus, and it is probable that persistent spasmodic stricture may have a like result.

The diagnosis of cardiospasm can easily be made from a permanent stricture due to ulcer, cancer, or other cause, by introducing a large-sized tube or esophageal sound. This will usually pass with only slight difficulty, encountering only a momentary opposition, when the closure is from spasm, but will fail entirely to go through an organic stricture. Further trials, then, with smaller sizes may succeed. In the latter class of cases a distinct sensation of a hard obstruction finally overcome will often be experienced when the smaller tube or sound passes into the stomach, though when a very small tube is used, no such sensation may be recognized.

It is not so easy to distinguish a chronic cardiospasm from a large diverticulum in the esophagus with a consequent difficulty in getting food or a tube to pass into the stomach; but by

a patient persistence with large-sized tubes, one can finally be introduced in the case of a spasm, after first encountering a resistance which is felt to yield, while, when there is a diverticulum, the entering is purely a matter of luck; either a large or small tube or sound will sometimes pass in easily, and at other times, being caught in the diverticulum, cannot possibly be made to pass. Then in the spasmodic cases, even when chronic, there are nearly always occasional times when, the patient being in an unusually good condition, the spasm relaxes and all symptoms cease temporarily, whereas, when there is a diverticulum or pouching of the esophagus or any organic obstruction, the symptoms never abate, but rather incline to become progressively worse.

You should bear in mind especially that in any form of organic disease causing obstruction or stenosis, small sounds or tubes can be introduced more readily than large ones, while, on the contrary, when a spasm of the cardia causes the obstruction, it is most easily overcome by the largest-sized instruments.

The Treatment of Cardiospasm.—This is in the main that of neurasthenia, which has been mentioned in connection with other gastric neuroses and fully described under the head of Nervous Dyspepsia. Locally, in addition there should be a systematic use of the largest-sized esophageal sounds or firm stomach tubes, one of which should be introduced daily and allowed to remain in position for ten to fifteen—some say thirty—minutes at a time. When there is a coincident gastric catarrh and much fermentation, the thorough washing out of the stomach daily with an antiseptic solution will prove doubly curative, provided a large and firm tube be employed for the purpose. Naturally you will also insist upon a careful, but nourishing diet, which at first should be liquid or soft, and upon a thorough mastication of all food. Indeed, a solid or semi-solid food, fully liquefied by prolonged mastication, is better than liquids, which cannot be chewed. When the spasm has been provoked by an ulcer or erosions near the cardia, the

frequent passage of a tube or sound would only aggravate, and it is then necessary to pursue the treatment suitable for the primary affection, including rectal feeding, and the latter is required also for the worst cases of cardiospasm dependent upon some neurosis.

Einhorn praises large doses of bromides in cardiospasm, and suggests, besides the remedial measures above mentioned, that in the chronic cases the patient after every meal should make a special effort, by an extraordinary pressing action long continued, to force on into the stomach any food lodged in the esophagus, and that every evening any remains of food left in the esophagus should be washed out with the help of a tube.

Spasm of the Pylorus (Pyloric Cramp, Pylorospasm).—

This is probably one of the most prevalent and most productive of injurious consequences of all the reflex and nervous gastric affections. Pylorospasm consists of a spasmodic contraction of the circular muscular fibers of the stomach outlet, whereby the latter is kept firmly closed for much longer periods during digestion than normal.

The commonest cause of this condition is a hyperacidity of the stomach contents, most frequently a true hyperchlorhydria,—an excessive secretion of HCl,—but it can doubtless be caused by an undue amount of the organic acids which result from fermentation. Possibly the ingestion of large amounts of sour fruits, tart wines, beer, vinegar, or other acid food or drink may have a like effect sometimes in neurasthenic patients. Large pieces of tough or hard and indigestible substances, whether ingested as food or otherwise, are probably also capable of setting up a pylorospasm in certain nervous persons, but, as a rule in such cases, the pylorus relaxes sufficiently to let the digested matter pass out, while the undigested pieces are retained often for long periods, as shown by their being brought up during lavage, days or even weeks after they were ingested. The seeds and skin of many kinds of fruit, and the tough pulp of oranges especially, are often detected in the wash

water when all the other contents of the stomach had passed on into the duodenum. In time, however, even such tough substances, when not too large, will usually make their way through the pylorus, which doubtless finally relaxes to an exceptional extent to permit their passage, except when there is a marked tendency to pylorospasm.

It has been assumed that spasm of the pylorus may sometimes be a primary disease and result then from nervous causes. This, though difficult to prove, is possible, but, if it exists as a primary affection, without hyperacidity or other reflex cause, it is doubtless extremely rare.

The symptoms of pylorospasm in its most severe form are violent and painful contractions of the gastric walls, ending finally in vomiting; except when there is a coincident spasm of the cardia, closing that orifice also. In case of the latter complication the pain and distention of the stomach become very great, and it is then necessary either to empty the viscus by introducing a tube, or else to administer full doses of some anodyne, especially morphine and atropine hypodermically. But such extreme cases are rare. In the milder ones in which the pylorus seems to remain closed for several hours longer than usual after each meal, the symptoms are merely an unpleasant feeling of weight or fullness in the epigastrium with generally increased fermentation and eructation of gases. The excessive fermentation and formation of large amounts of acetic, butyric, and sometimes also of lactic, acid may irritate the gastric mucosa, thus adding to the discomfort, besides tending to the development of chronic catarrhal inflammation, hyperæsthesia, etc. Moreover, the augmented amounts of the organic acids doubtless aggravate the pyloric spasm, and thus a vicious circle is produced.

The worst feature, however, of the affection is that, when unrelieved, it almost uniformly causes atony of the gastric musculature which ultimately develops into dilatation. Most cases of so-called atonic dilatation of the stomach are probably produced in just this way. There is often also considerable

tenderness on pressure or even gentle palpation over a spasmodically contracted pylorus.

The treatment of pylorospasm is for the most part that of hyperchlorhydria and that of excessive fermentation and organic hyperacidity, which are fully considered in the lectures on Sthenic Gastritis, Hyperchlorhydria, Gastric Flatulency, etc. In a few cases, doubtless, the spasm is primary and merely an expression of the neurotic diathesis, the real disease being hysteria, or possibly neurasthenia. The treatment, then, must obviously be that required for the underlying nervous condition and should include the various strengthening remedies and measures to which I have so often referred.

Peristaltic Restlessness (Hyperperistalsis).—Following Kussmaul, authors generally describe under the above head a symptom denoting a disturbed innervation of the stomach. This, when severe (which is rare), may occasion a patient much annoyance. It is simply an exaggeration of the normal peristaltic waves or rhythmic contractions of the stomach walls which pass usually every few seconds from the cardia to the pylorus. In the abnormally excited condition these waves, which are not felt in health, are much increased in force and frequency, insomuch that the patient is conscious of them and sometimes much disturbed by them. At times they are reversed in direction—antiperistalsis.

When the stomach is dilated or displaced downward, the contractions are plainly visible below the ribs and can be easily felt upon palpation. The affection may extend beyond the stomach, involving the intestines also. The contractions often produce a loud gurgling noise when both gases and liquid are present in the stomach.

The Causation of Peristaltic Unrest.—It is held by some that the trouble always coexists with either spasm or other obstruction of the pylorus and results therefrom, but it is probable that a sufficiently great irritation of the motor nerves of the stomach can cause hyperperistalsis or even antiperistalsis in the absence of any obstruction at the outlet.

Any powerful stimulation of the gastric mucosa as from hyperacidity, overloading of the stomach with food, or its overdistention with gas, tends to excite the affection in neurotic persons, and hyperæsthesia of the mucosa further conduces to it. But pyloric obstruction is certainly a strongly predisposing cause, if it be not an indispensable factor in the ætiology.

The symptoms have already been described above, and the affection cannot well be mistaken for any other when the stomach extends below the ribs so that the contractions can be seen and felt. In the rarer cases in which the stomach is of normal size and in its normal position, the trouble may be easily overlooked, if mild, or may then be considered as a form of nervous dyspepsia. In the severer forms, even though the viscus does not extend below the ribs, the affection should be suspected from the conjunction of the peculiar uncomfortable sensations, not often amounting to actual acute pain, with frequent loud gurgling. The disease is then also likely to be complicated by excessive eructations and even vomiting. Furthermore, the nutrition will suffer, the digestion being impaired as in most excessive aberrations from the normal, and the patient will often lose so much in weight and strength as to awaken the suspicion of malignant disease.

The prognosis is good, as a rule, when there is no insuperable obstruction of the pylorus or other organic disease, provided the patient is able and willing to persevere with the necessary therapeutic measures.

The treatment demands (1) the removal of any existing cause such as hyperacidity, gastric hyperæsthesia, overeating, insufficient mastication, or any curable obstruction of the pylorus, and (2) the cure of the underlying nervous condition by the methods so often described in these lectures. Electricity in the form of galvanism to the spinal centers, and to the vagi in the neck with the positive pole, either over the epigastrium or within the stomach, the high-tension faradic current intragastrically applied, or the static wave current

to the spine and epigastrium alternately is the most efficient remedy.

But such patients need, most of all, to live hygienically in every way, avoiding all excesses, especially sexual irregularities and mental overwork.

Sedative drugs, such as the bromides, hyoscyamus, etc., may be temporarily necessary, and the nerve and blood tonics can usually be so used as to hasten the cure.

Nervous Eructation.—This subject is considered along with the other types of eructation in Lecture LXXIV., on Excessive Eructation and Gastro-Intestinal Flatulency in General. Its importance seems to me to have been somewhat overrated by writers generally, and I shall not take up further space with it here.

Nervous and Reflex Vomiting.—The complex act of vomiting is produced by a peculiar combination of muscular movements, including a contraction of the abdominal muscles and of the pylorus as well as of the gastric walls, and a relaxation of the cardia, besides a shortening and widening of the gullet and a shutting off of the windpipe and nares by the action of the epiglottis and soft palate. It occurs as a symptom of various diseases of the stomach and intestines, especially of ulcer and carcinoma, gastrectasis, pylorospasm, and also insufficiency of the cardia.

Again vomiting occurs reflexly as a result of irritation in various remote parts of the body, particularly the genital organs, but also of the pharynx, as well as from eye-strain, and especially from inflammation of the peritoneum. When emesis occurs in an apparently causeless manner, without any lesion near or remote being discoverable, it is called nervous vomiting. In hysteria and marked neurasthenia it is doubtless often a pure neurosis, the result of an irritation in the nerve centers or nerves themselves. The vomiting of the gastric crises in locomotor ataxia is usually so classed.

Nervous vomiting in certain of its forms is believed to be due, in part at least, to insufficiency of the cardia, and possibly

in most cases of such vomiting a relaxed condition of the cardia predisposes to it.

Authors describe among the forms of nervous vomiting what is called *juvenile vomiting*, which affects especially school children as an alleged result of overstudy, but more likely of eye-strain from a faulty arrangement of their desks with relation to the position of the windows, or from uncorrected ocular faults. This form of the affection does not seem to have any very distinctive symptoms. It may be known only from the lack of other cause, and is remedied by taking the children out of school, by fitting proper glasses, etc.

Stockton, the American editor of Riegel's "Diseases of the Stomach," refers, in a note under Nervous Vomiting, to the "periodic or cyclic vomiting in children," which has been much discussed by pediatricists in this country during the past ten years, but would seem to be a different disease from the juvenile vomiting described by German and American gastrologists, since it appears first at the age of two or three years. It is a serious affection accompanied by great prostration, and often proves fatal.

Periodic vomiting is another variety which has been described by Leyden. It recurs somewhat regularly, like migraine, at more or less definite intervals, with sometimes headache, which may be severe and from no discoverable cause. This may possibly be merely migraine without the usual intensity of headache. In some of the cases there are constipation and symptoms of indigestion in the intervals, but as a rule the patient is well between the attacks. These may last a few hours only or several days. They seem to require the usual treatment of migrainous attacks, to wit: rest, pellets of ice, morphine, belladonna, etc. As in the case of that disease, too, there does not appear to be any line of treatment yet tried which will surely prevent a recurrence of the attacks in all cases. Possibly remedying ocular faults or other causes of reflex disturbance might prove more successful.

The diagnosis of nervous vomiting can only be made by ex-

clusion—the apparent absence of any sufficient cause. It is generally not preceded by much nausea and is easy in character as compared with that dependent upon indigestion, or other real gastro-intestinal disease, which may signify that there is a relaxed or easily relaxable cardia. In Leyden's periodic form, however, there is often nausea, and the vomiting may be very severe and difficult to control.

When the patient is very neurasthenic, or especially if hysterical, attacks of apparently causeless vomiting may be set down as neurotic, when a thorough examination has revealed no lesion in the eyes, digestive tract, or pelvis, and no displacement of the kidneys which could have excited it reflexly. In such cases some of the dorsal vertebræ—or to be more exact, the intervertebral spaces on one or the other side of the spine—will often be found tender on pressure. The diagnosis from gastroxynsis is made by determining the absence of any marked excess of HCl.

The vomiting not only occurs usually with little straining or discomfort, but produces very little depression. The patients continue, as a rule, to be well nourished and enjoy comparatively good health. Then, too, the attacks of vomiting are prone to follow psychic disturbances. Sometimes certain kinds of food will always be vomited in such attacks, while other kinds will regularly be retained. For example, solid foods may be vomited and liquids retained, or vice versa.

The treatment of an attack of nervous vomiting should aim to secure rest and sedation. The patient should be placed at complete rest, preferably in bed, and hot, moist applications be made to the epigastrium. In some severe cases sinapisms or turpentine stupes may accomplish still more. The best results will follow the withdrawal of all food by the mouth, and feeding, if necessary, by the rectum, though very small quantities of bland liquid food may be tolerated in the milder cases. The following mixture will usually prove effective if any medicine should be required in addition to the measures just mentioned:

R Bismuthi subnit.....	3 i
Cerii oxalat.....	3 ss
Glycerit. ac. carbol. (1-4).....	<i>m</i> xx
Sps. chloroformi } aa.....	f 3 iss
Tr. cardomon. co. }	
Aquæ menth. pip.....	f 3 iv
Aquæ calcis.....	q. s. ad f 3 ii
M. Sig. Teaspoonful in a tablespoonful of water every hour till relieved.	

Between the attacks, your efforts should be directed to the general condition, and to an improvement of the nerve supply of the stomach as well as of the nervous system in general. A particularly efficacious method of accomplishing these objects is the application of galvanism 3 to 15 ma.—with the negative pole stable over the epigastrium, in the form of a flat electrode about four to five inches square, and the positive as a small sponge electrode passed over the tender region alongside the spine for from five to ten minutes every other day. A current of 2 to 5 ma. should also be applied to the vagi in the neck for two or three minutes at each séance. Static sparks over the epigastrium and the static breeze or wave current over the spine will often do as well or better; and very brief applications with a good rigid mechanical vibrator, over the same regions, will also prove helpful.

In all difficult or stubborn cases, a thorough search should be made for some direct or reflex cause of the trouble. An examination should be made of the pelvic organs, for movable kidney or other ptosis, and for a swelling in the region of the appendix. Not to discover an existing lesion in any of these regions, which had excited the vomiting, would be to meet with failure. You would naturally examine also the vomited matter to see that it did not contain an excess of HCl, pointing to a possible ulcer, gastroxynsis, Reichmann's disease, or even a simple hyperchlorhydria, any one of which might give rise to severe vomiting; and look carefully in the ejecta for blood or changed blood, which might have come from a latent ulcer or carcinoma. The finding of any of these things would lead you to shape your treatment accordingly,

and not only to direct your remedial measures more successfully, but also enable you to give a more accurate prognosis.

Treatment of Reflex Vomiting—Pernicious Vomiting of Pregnancy.—In the treatment of these forms of vomiting, it goes without saying that the main thing is to remove the cause—cure the primary affection. To take up all the possible diseases and special conditions which can cause reflex vomiting, and consider the treatment suitable to each, would far transcend the limits of these lectures. In the case of one of them, however,—the pernicious vomiting of pregnancy,—some consideration of the most approved remedial measures is desirable, since it is a serious complication which quite unnecessarily destroys many valuable lives.

Systematic lavage has cured numerous cases of this affection, but probably those only which were dependent in part upon chronic gastric catarrh or dilatation with excessive fermentation. Treatment addressed to the nerves supplying the stomach, and measures designed to lessen the reflex irritation near its source, have occasionally proved successful. For strengthening the gastric nerves the mode of applying electricity to the spine, epigastrium, and vagi in the neck, already described above as useful in nervous vomiting generally, promises most. Hot, moist applications, or even blisters over the epigastrium, often afford relief.

The local treatment should consist first in correcting any existing displacement or other fault. Next after this, the most effective in lessening or diverting into other channels the reflex irritation has been some decided revulsive application to the os uteri, and Hirst¹ reports that sometimes he has found a simple vaginal examination sufficient to check the vomiting. Usually a powerful impression must be made upon the uterine nerves to prove curative. An application of Churchill's tincture of iodine will sometimes succeed, but a surer means is one long used successfully by Dr. Jacob Price of West Chester, Pa. It consists of the old-fashioned method of

¹ "Text-book of Obstetrics," Saunders & Co., Philadelphia, 1903.

cauterizing the *os uteri* externally with nitrate of silver in stick form. When this fails, a cautious dilatation of the cervix uteri, under strict aseptic precautions, with a series of graduated bougies, will occasionally stop the vomiting without bringing on premature labor.

Edgar reports that he has "dilated the internal os in primigravidæ, curetted the cervical canal, scraped the cervix itself free from erosions, applied pure carbolic acid to the cervix and canal, and obtained a cure without interrupting pregnancy in a number of cases given up as hopeless and sent to the hospital to have labor induced." He adds that "the finger will occasionally serve as a dilator, and in early cases the greatest care must be used not to rupture the membranes."¹

But such measures should be resorted to only after a consultation with another physician, so that if they should fail to accomplish their intended object, and labor should result, the latter could be accepted and welcomed as the proper alternative.

When other means are ineffective, the uterus should be emptied as promptly as possible. I have seen very precious lives sacrificed by delaying too long to obey this imperative indication, when other measures had failed to stop the vomiting within a reasonable time. The patient's vitality finally became exhausted before the operation was attempted. The induction of premature labor promises little or nothing to an exhausted woman, but to rescue her, must be done while she still has a good degree of strength.

In very aggravated cases, not more than two weeks at the most should be spent in experimenting with palliative or conservative remedies, and, meanwhile, nutrition should be maintained by means of rectal feeding. In less serious cases in which the flesh and strength are being but slightly lowered, it may be safe to wait until the end of the third month, when, as a rule, the vomiting tends to cease of itself. If after that, two weeks of further treatment have effected no progress toward a cure, labor should be purposely brought on and the uterus

¹ "The Practice of Obstetrics," Blakiston's Son & Co., 1903.

emptied, provided dilatation of the cervix fails to bring relief or of itself set up uterine action.

In all severe cases the patient should be kept in bed, sexual intercourse prohibited, and her strength spared in all possible ways.

Drugs usually fail to help much, but the prescription for a sedative mixture which I have given in the former part of this lecture for the treatment of nervous vomiting generally, may sometimes succeed, as will occasionally 1-10-grn. doses of calomel given every hour or two till purgation results. Bromides, opiates, or hyoscyamus by suppository, or hypodermically, occasionally assist in controlling the vomiting.

But let me repeat that, in many of the more serious cases, to empty the uterus offers the only hope, and this must not be postponed too long.

Nervous Atony of the Stomach.—This is sufficiently discussed in Lecture XXXVI. under the head of Gastric Atony or Myasthenia Gastrica, etc. The various forms of atony, both neurosal and otherwise, are therein considered at much length. The subject is again referred to in this connection, for the reason that most authors class Gastric Atony among the neuroses of the stomach. I think, however, it has been shown in the lecture above mentioned to be predominantly a result of either local inflammatory or mechanical conditions, or depraved constitutional states in which the weakening of the gastric musculature has been produced by a generally lowered nutrition, including usually impoverished blood.

But the affection is doubtless sometimes encountered as a consequence of psychic influences coming on more or less suddenly during apparent health. When it thus occurs, the absence of any of the more usual ætiologic factors and the history of a shock or other nervous disturbance should enable you to differentiate it.

The treatment would then consist of a removal of such cause or the combating by appropriate measures of any depressing influence, and at the same time fortifying the nearly always

excessively vulnerable nervous system. Persons endowed with a strong constitution and sound nerves are not likely to have their stomachs seriously give out from any mental, nervous, or emotional disturbance.

Insufficiency of the Cardia, Rumination, Regurgitation, etc.

—It is convenient to assume, as most authors do, that there may be a sort of paresis of the cardia. The habit of rumination—that is, the frequent raising without nausea of ingesta from the stomach into the mouth, then chewing them further and swallowing them again,—or the very similar habit of bringing up without effort or nausea food previously swallowed, and actually ejecting it—regurgitation—are generally considered to result from an abnormally relaxed state of the circular muscle which forms the sphincter of the cardia. Inordinate belching and very frequent as well as quite easy vomiting are often attributed to the same defect. There is no absolute proof, however, that these symptoms result from any such cause, though rumination has been observed in a case afterward shown, at autopsy, to have been one of carcinoma of the gastric walls, including the cardia, which was abnormally wide, while there was also cylindric dilatation of the esophagus.

Another theory as to the causation of such symptoms is that they are due to an irritated state of the vagus and overstimulation of the dilator nerve of the cardia.

Much has been written concerning regurgitation and rumination, or merycism, but when it is carefully sifted, only a few grains of actual reliable information about these habits remain. Owing to the absence of effort or disturbance associated with the acts, the prevalent belief, that a lack of tone in the sphincter muscle of the cardia is at least a contributory cause, is probably well founded. But extensive observations by numerous careful investigators prove that neither excessive nor deficient motility nor excessive nor deficient gastric secretion plays any part in the ætiology.

Rumination has been shown to result from imitation in several instances, and both habits are most frequently seen in

hysteric or neurasthenic persons. Insanity, imbecility, and epilepsy still more strongly predispose to them. Rapid and excessive eating and imperfect mastication may unquestionably prove efficient as predisposing causes. Gastritis and other lesions of the stomach are believed sometimes to produce the affections.

The treatment of regurgitation and rumination will prove successful in most cases if faithfully persevered with, and if the patients have sufficient will-power to do their part. They must be taught to chew all food until it is either liquefied or pulped, and energetically oppose with a strong effort of the will any tendency to let any of it come up. When the habit has been to eject the regurgitated material, the first step must be to retain it in the mouth, when the impulse to raise it cannot be at once controlled, and then, after further chewing, to swallow it again. This converts regurgitation into rumination. Then, by the utmost possible exertion of will-power, aided by the imperative commands of the physician, the latter practice may often be finally overcome, even without other treatment. But all the oft-advised therapeutic methods useful for neurasthenia, including cold sponge baths, regulated exercises, outdoor life, and especially electricity, may be employed with advantage as adjuvants to the cure. Galvanism or high-tension faradism, externally or within the stomach, will be found generally useful, and the static spark, applied to the region of the cardia, should prove especially effective. Full doses of strychnine have also been highly praised for their curative action in these affections. In all the more stubborn cases, at least, you should test the stomach contents and combat with appropriate remedies any excess or deficiency of HCl. Observations upon one ruminant showed hyperchlorhydria, and he was then quite rapidly cured by the administration of alkalies. This led to the theory that rumination depended upon hyperacidity and could be cured by alkaline treatment. But another observer disproved this theory when he reported a series of cases showing a deficiency of HCl, and responding well to HCl given as a remedy.

Insufficiency of the Pylorus.—It is well known that the pylorus may lose its power of closing tightly and remain unduly patulous as a result of certain mechanical causes. Among these is carcinoma or ulcer of the part acting through a process of infiltration of the circular muscular fibers of the pylorus, as a result of which the latter are permanently stiffened—rendered incapable of efficient contraction. Obstruction of the duodenum by a stricture from any cause (as carcinoma, round or peptic ulcer, or syphilitic, tuberculous, or simple catarrhal ulceration), or by the closing of its lumen from the pressure of a tumor, or a movable kidney, etc., may produce a like condition.

Since Ebstein demonstrated a relaxation of the pylorus as a consequence of pressure myelitis, authors have generally assumed the possibility of, and described a nervous insufficiency of the pylorus. Riegel, however, has never encountered any case of the kind, and a number of prominent gastrologists seem to lack personal experience with such a condition. Injury of the portion of the cord whence emerge the motor nerves that supply the sphincter muscle of the pylorus may doubtless paralyze it, but such an injury must be rare, and the possibility of it by no means warrants us in assuming a neurotic incontinence of the pylorus comparable to the neuroses which are familiar phenomena of hysteria or neurasthenia. Ebstein's case was no doubt a true paralysis of the pyloric sphincter, and in no proper sense a neurosis. When pyloric incontinence exists in the absence of any mechanical cause for it, the more plausible explanation seems to be the one championed by Knapp, viz., that the muscle has become exhausted by long overaction.

Other cases of apparent pyloric insufficiency, in which no lesion could be discovered in either the pylorus itself or in the duodenum, have been reported by Ebstein, and there is no doubt that such cases do occur. Ewald says on this head: "Unfortunately we have no diagnostic criteria by which we may establish the existence of this condition as dependent upon atony of the pyloric sphincter—*i. e.*, a pure neurosis—

for an occasional incontinence of the pylorus is a normal phenomenon."¹

The symptoms of pyloric insufficiency are abnormally rapid emptying of the stomach, a difficulty in inflating it with air or CO₂, and the frequent finding of bile in the wash water during lavage. The first symptom has been commonly explained as due to hypermotility or overexcitation of the gastric peristaltic apparatus, but I am now convinced that atony of the pylorus may also cause it.

Diarrhea following immediately after the ingestion of very hot or cold or insufficiently masticated pieces of hard or tough food might be due to pyloric incontinence, but would not alone be conclusive.

The one sure means of demonstrating the sufficiency of the pylorus is by intubating it according to the Hemmeter method with one of the ingenious instruments devised by Hemmeter and Turck in this country and F. Kuhn of Giessen. With regard to the question of priority, it may now be regarded as settled that both Hemmeter and Turck in this country intubated the duodenum through the pylorus before the procedure was attempted by Kuhn.

Knapp² insists that insufficiency of the pylorus is quite frequent, and that it is the natural result of a prolonged condition of hypertonicity of the part, the overtaxed muscle finally becoming exhausted and weak. He maintains that delayed emptying of the stomach is generally due rather to an over-vigorous contraction of the pylorus (pylorospasm) than to atony of the gastric muscle (which is doubtless often true of the earlier stages of prolonged retention of food in the stomach), and conversely that a too rapid emptying of the stomach is evidence rather of an exhausted and relaxed pylorus, than of hypermotility of the gastric walls. From this point of view, the symptoms of pyloric insufficiency, beside the reflux of bile or other duodenal contents into the stomach, are the failure

¹ "Diseases of the Stomach," New York, 1892.

² *Jour. Am. Med. Assn.*, April 16, 1904.

to find any gastric contents or the usual quantity of them at the end of an hour after the test breakfast, and it would follow further that most of the symptoms of intestinal indigestion, such as flatulency, pains in the bowels, constipation, or diarrhea, may be produced or aggravated by pyloric incontinence from any cause.

The treatment of pyloric insufficiency may be hopefully undertaken when there is no organic lesion. The more fermentable foods and drinks, effervescent beverages, and also, generally, coffee and tea must be avoided. Thorough mastication of all food is particularly important. Combinations of an alkali with bitter tonics are often helpful. Nearly all authorities agree in recommending strychnine in full doses; and electricity is praised by those who have had most experience with it. The faradic current applied intragastrically will prove the most efficient form of administering it. Static sparks taken directly from the pyloric region are capable of powerfully stimulating the weakened muscle. Massage of the abdomen, vibratory stimulation, and cold affusions to the part are also useful.

LECTURE LXXVII

NERVOUS DYSPEPSIA (GASTRO-INTESTINAL NEURASTHENIA)

THE conceptions of nervous dyspepsia have been almost as various as the authors who have written upon it, and the ailments which are given this name by physicians in practice are very often something else—direct or indirect results of pathologic changes, such as the inflammatory affections, muscular insufficiency, dilatation or displacement of the stomach, displacement of one or both kidneys, or disease or disorder of some kind in the intestines.

In probably more than half the cases of so-called nervous dyspepsia, the trouble is dependent upon actual disease somewhere in the gastro-intestinal tract, though very often such cause is unrecognized and, it may be, unrecognizable.

The mythologic deities of antiquity have all disappeared as scientific causes have been discovered for phenomena previously considered supernatural, and in like manner nervous dyspepsia may ultimately cease to be classed as a distinct type of disease when our methods of diagnosis shall have become more perfect. The fewest cases of it are encountered now by the men who are the most expert and painstaking in their examinations.

There is no apparent appropriateness in giving this designation to any gastric derangements or symptoms that result from organic changes in other organs, as the heart, lungs, kidneys, or even in the central nervous system. Thus the gastric crises of tabes surely should not be called nervous dyspepsia any more than the vomiting of Bright's disease or of strangulated hernia. Possibly there may be some reason, however, for considering under this head the frequent gastric symptoms of hysteria. The symptoms resulting from abnormalities of secretion by the

gastric glands are classed by some writers under nervous dyspepsia, but I prefer to limit the term strictly to forms of indigestion or gastric symptoms which cannot be traced to any organic lesion, and are not the manifest result of even any well-known so-called functional affection.

In general neurasthenia it is usual to have the digestion more or less impaired, and most frequently then there is either a rather persistent increase or diminution of the gastric juice, to which the discomforts present may be attributed. Sometimes, however, you will see cases in which the neurasthenia will seemingly be limited to the stomach and intestines, no complaints being made of any function except those of digestion and defecation. You may be unable to discover a lesion of any kind in any of the organs.

It is convenient at present to retain the name nervous dyspepsia for these as well as possibly for the type of indigestion occurring in the course of that form of general neurasthenia in which mental depression, and a marked delicacy or sensitiveness of the nervous system, with a great variability of symptoms, exist without any discoverable dependence upon disease having its origin in the intestines, liver, or elsewhere in the digestive system. The term, then, shall be limited here to the apparently causeless dyspepsias, and experience shows that these are found usually associated with neurasthenia.

Symptomatology.—Any form or shade of pain or unpleasant sensation referable to the stomach or intestines may be complained of. Nausea, vomiting, gaseous distention, sensations of dragging, fullness or weight (though these last generally indicate motor insufficiency or a demonstrable weakness of the stomach walls), heaviness, drowsiness, dizziness, prostration or languor, flatulency, headache, or mental irritability during the digestive period, may be present in nervous dyspepsia. In short, it may mimic almost any of the symptoms of gastric disease, or many of those usually seen in intestinal disorders. The discomfort occurs, as a rule, during the digestive period only, and the patient generally feels well when the stomach is

empty. The ganglia presiding over the nerves of the stomach may be presumed to be at fault in some way in these cases. Ewald refers to the investigations by Jürgens¹ on the bodies of forty-one patients who had complained of vague dyspeptic disturbances during life, showing a complete degeneration of Meissner's and Auerbach's plexuses. However this may be, the innervation of the gastric structures is faulty; and just as in general neurasthenia there is an excessive impressionability and an undue response to all stimuli, so in gastric neurasthenia there may be an excessive secretion of the gastric juice after taking food (especially meat or acids), or a depression of such secretion below the normal with an absence of free HCl, if the patient chance to drink a pint of some alkaline table water or to be taking an alkali or belladonna as a medicine. But when the aberration of secretion is marked enough to have set up a decided and persistent hyperchlorhydria, the case could no longer be properly designated as one of mere nervous dyspepsia. Then, any of the symptoms of general neurasthenia may be present, such as mental depression, insomnia, special fears, as of crowds, closed places, elevators, etc., and greatly increased impressionability.

One symptom of importance that is considered characteristic by most authors is a lack of relation between the amount of indigestion and the quality of the food taken. For instance, the true nervous dyspeptic will often complain as much after eating bread and butter or plain beefsteak as after a complicated mixed meal including shell-fish or mince pie. But there are apparent exceptions to this statement. Notwithstanding the fact that with them one food is digested about as well as another and produces usually the same amount of discomfort, gastric neurasthenics are prone to fancy great differences and to deny themselves one class of foods after another, until at last they attain a condition of subnutrition which amounts to semi-starvation and seriously aggravates their disorder. When given a diet table they readily abstain from the articles forbidden, but

¹ Jürgens, *Verhandlungen des III. Congress f. innere Medecin*, S., 523.

neglect to make up the deficiency from the allowed list, and the observant physician soon finds them losing flesh faster than before, merely from a lack of sufficient food.

Numerous intestinal symptoms and diseased conditions have been described as frequently accompanying nervous dyspepsia. These may include constipation, diarrhea, gaseous distention, either general or partial (spastic phenomena), tender areas over the colon especially, membranous colitis, etc. These phenomena are indeed exceedingly common in association with neurasthenia, both gastric and general, but in many cases are probably the cause rather than result of the nervous condition, or if an inherited nervous dyscrasia was the first link in the chain, a vicious circle has been formed, and the two conditions act and react upon each other in an injurious manner.

The skin over the stomach may be unduly sensitive, both before and behind, and on either side of the spine corresponding to the origin of the nerves supplying the stomach. Especially over the ganglia of the great sympathetic system, deep pressure will be likely to cause pain.

Diagnosis.—This calls for the most thorough examination of the entire body, including the secretions, excretions, and the blood, in order to exclude any organic disease. When all the organs, including those of the alimentary canal, are found to be healthy, and there is complaint of pain, discomfort, or any symptom directly or indirectly referable to the stomach, especially during the period of digestion, it may be attributed to nervous dyspepsia. If it is very fitful and changeable, now here, now there, depending much more upon the mood or associations and surroundings of the patient than upon the quality or quantity of food ingested, it will tend to confirm the diagnosis. It is often extremely difficult to exclude positively the existence of a mild form of gastric or intestinal catarrh, or ulcer, not to mention incipient cancer, and it is by no means possible to make the decision after a single examination, however complete and expert, including a single analysis of the gastric contents or feces. Without a resort to the recent exact

methods of examination, any diagnosis must be only a more or less shrewd guess.

To exclude gastric catarrh you will need to ascertain by lavage either that there is no considerable amount of mucus in the stomach, or, if mucus be found in the wash water, that it comes from the nose, throat, or œsophagus—that it was not secreted in the stomach. In doubtful cases a microscopic examination of portions of the gastric epithelium may be necessary to decide.

You will be able *to exclude hyperchlorhydria and anacidity* or hypoacidity of inflammatory or degenerative origin by careful analyses of the stomach contents, which may have to be made more than once. If you find as a constant condition during digestion a large excess of HCl, the case will be either one of hyperchlorhydria or acid gastric catarrh, unless there should be also an excess during a fasting period, when the trouble would be Reichmann's disease, or unless there should be pronounced tenderness on pressure over the region of the stomach, hemorrhage, or the peculiar aggravation of pain from taking food, which is characteristic of gastric ulcer, in which case that disease should be strongly suspected. A slightly diminished secretion, or marked variability of secretion, would not be inconsistent with a diagnosis of nervous dyspepsia, but when there is constantly found a very marked deficiency of HCl, the diagnosis should be hypochlorhydria or hypopepsia, and when there is an absence of secretion the disease should be called anadenia gastrica or achylia gastrica. Lessened secretion with the microscopic findings of chronic asthenic gastritis would point to that disease, unless there should be a palpable tumor or, with a very marked cachexia or hemorrhages, the Boas-Oppler bacillus should be found in the wash water, when the more probable diagnosis would be carcinoma, complicated, as it usually is, by gastritis. The presence of a decided percentage of lactic acid would also tend to confirm the diagnosis of cancer, though not incompatible with an aggravated form of chronic catarrh of the stomach. Such a careful and painstaking ex-

clusion of possible gastric diseases is necessary, because the depressed nervous condition which is characteristic of nervous dyspepsia, and even the complete symptom-complex of neurasthenia, are frequently present in hypochlorhydria as well as in both cancer and chronic asthenic gastritis especially, and may be in ulcer or hyperchlorhydria, particularly when these have been of long standing. Chronic intestinal catarrh with constipation is probably one of the most frequent causes of dyspeptic symptoms which are constantly diagnosed as nervous dyspepsia. Derangements of the liver, catarrh of the bile-ducts, etc., are other very common causes of such symptoms, and when not accompanied by jaundice are often overlooked. Then, the various diseases of the pancreas, which have only recently been studied with any thoroughness or promising results, are doubtless responsible, in part at least, for a large amount of the distress which is labeled nervous dyspepsia.

Prognosis.—Nervous dyspepsia is generally curable and, if uncomplicated, should never prove fatal. But when there is a strong inherited tendency to neurasthenia, the cure may be very difficult and prolonged. In such cases, too, it is often an indispensable condition that the patient shall be in a position to have a complete rest from injurious pursuits or excessive activity of any kind, if not actual rest in bed for a few weeks; or at least a change from a sedentary or professional occupation to an outdoor life, and, temporarily at least, from a residence in a city or large town to one in the country, mountains, or at the seashore.

Treatment.—If the case has been correctly diagnosticated, and is very severe or of long standing, it is well to begin with some modification of the Weir Mitchell rest treatment, especially when the patient is a woman. Rest in bed and seclusion, with full regulated feeding, massage and electricity for four to eight weeks, followed by gradually increased exercise in some healthy climate out of doors, will of itself go far toward curing many cases. But when, instead of true nervous dyspepsia, the case is one of neurasthenia complicated with or

resulting from gastric catarrh, and especially if there be a considerable displacement or dilatation of the stomach, as is so exceedingly common in neurasthenic women, the rest cure, if carried out without regard to the gastric trouble, is usually not very successful, and sometimes even aggravates. In gastric dilatation it is contra-indicated, unless considerably modified, since the liquid diet then disagrees from the start.

Men need to be given a long vacation from business and kept out in the open air. A hunting or camping trip of several weeks, or a long sea voyage, often accomplishes wonders. And afterward there should be such a complete reform of the patient's mode of life as to insure more hours for recreation and sleep and a less strain upon the nervous system.

Depressing or injurious habits of all kinds must of course be abandoned. Spending regularly an hour or two daily out of doors during the remainder of life, on horseback, or walking, or driving (or on a wheel, provided care be used not to over-exert), will usually complete the cure and render it permanent.

As to *diet*, while very indigestible dishes are better avoided, there is need of full nutritious feeding, and there should be such a variety of well-prepared viands as to tempt the appetite, since in the majority of these cases too little food is taken.

Both *central galvanization* and *general faradization* are helpful and *static electricity* sometimes accomplishes still more. Abdominal, or better yet, full general, *massage* nearly always effects good results—indeed may cure of itself—that is, provided the disease is nervous dyspepsia and nothing else. If there is hyperchlorhydria or acid gastric catarrh, instead, as in a certain proportion of the cases so classed, abdominal massage vigorously given will do harm decidedly. In the cases associated with a spastic condition of the intestinal musculature resulting in constipation and painful collections of gas confined in knuckles of the bowels, the massage over that region, if any at all is given, needs to be very gentle and soothing, without any percussion, slapping, hacking, or other exciting procedures. It should not include even deep kneading.

The drug treatment should be much the same as that for neurasthenia generally—nerve tonics and tissue builders mainly, such as iron, arsenic, gold, the hypophosphites and especially the glycerophosphates. In this connection mention may be made of a preparation of bone-marrow and nucleo-albumins, which I have used largely in these cases during the past few years with a gratifying degree of success. It is sold under the name of Hemaboloids (not the stronger form containing arsenic and strychnine), and is one of the few medicaments which, in a variety of gastric affections, I have found efficient in overcoming anæmia and debility without deranging the digestion. Next in usefulness in my hands has been a combination of sodium glycerophosphates with strychnine. In a majority of cases little or no medication will be required, provided the hygienic and dietetic treatment already outlined is properly carried out.

When the gastric juice is deficient—as it so often is in such cases—you will nearly always obtain good results from administering HCl and some active preparation of pepsin, but for some cases one of the preparations of papain may be still more effective. Constipation should be overcome, if possible, by diet, massage, electricity, and gymnastics with the help of enemas of olive or cotton-seed oil (though, during the rest treatment, aloes or cascara is often necessary), and riding horseback is a good adjuvant. (See Lecture on Constipation.) In the cases in which there is a decided tendency to an excessive secretion of HCl, calcined magnesia or sodium sulphate usually suits better than the bitter tonic laxatives.

For the worst cases a permanent abandonment of sedentary, or a too engrossing professional occupation is necessary, and a change from the city to the country or shore always conduces powerfully to a cure.

LECTURE LXXVIII

NEUROSES OF THE INTESTINES

MOST of the affections generally considered under the above head are of either complicated or obscure origin. The subdivision Secretory Neuroses is often made to include Membranous Catarrh (Colica Mucosa), and under either this or Motor Neuroses are classified Constipation and Diarrhea. There doubtless are nervous forms of all these diseases. But they are large and many-sided subjects, which require a broad and general consideration in all their phases. Constipation, for example, is as much a secretory as a motor neurosis, and is a symptom of many organic diseases. I have deemed it best, therefore, to refer briefly to the unimportant nervous forms of diarrhea, along with the other types of the same disease, in a separate lecture, and to devote an entire lecture also to constipation, as well as to the interesting subject of Membranous Catarrh of the Intestines, under which head both the neurotic and the inflammatory type of that disease are considered.

Intestinal colic, which most authors exclude from the neuroses altogether, seems to me to be an especially complex neurosis involving both the motor and sensory nerves of the bowel surely, and possibly also the secretory. Meteorism, or an excessive amount of flatus in the intestines, may be partial, caused then by obstruction of one or more coils through displacement, kinking or otherwise, or may be general, in which case it is manifestly due chiefly to atony of the bowel, along with possibly a derangement of the absorptive function of the intestinal mucosa, the former of which is clearly neurosal, and the latter of which may be.

The neuroses of the intestines which are not discussed in special separate lectures shall, therefore, be here grouped as

their ætiology and relations suggest, without attempting to classify them under the separate subheads Secretory, Sensory, and Motor.

ENTERALGIA, INTESTINAL COLIC, ENTEROSPASM, AND METEORISM

Enteralgia may exist by itself as a sensory neurosis of the intestines—or at least of the corresponding nerve plexus of the sympathetic—a neuralgia then pure and simple. With it there is often associated, though not necessarily, a spasmodic contraction of the intestinal muscles showing an irritation of the motor nerves also. This combination constitutes intestinal colic, which, however, may also have other causes. When there are irregular contractions of both the longitudinal and circular muscular fibers of the intestines at once without pain, there results enterospasm, and some would include under the head enterospasm cases of prolonged tonic spasm of the bowel with pain, while admitting that the latter cannot be differentiated from colic. In enterospasm the abdomen is likely to be either flat or boat-shaped (retracted), when the larger part of the intestine, and especially when the entire intestine, is involved, as in lead poisoning or basilar meningitis, particularly the tubercular form.

In *meteorism* or *tympanites* there is primary or secondary paresis of some part or all of the intestines, with a resulting distention of the latter, and often great swelling of the belly. The secondary forms may result from any of the various causes of obstruction.

These different affections are all closely related, and involve primarily or secondarily derangements of one or more of the sets of nerves supplying the intestines. All are accompanied by constipation, more or less obstinate. Indeed, spastic constipation is a very troublesome condition which may result directly from an enterospasm in some part of the bowel.

Grouping these allied disorders facilitates an understanding of their causes, relations, and the therapeutic methods re-

quired. After describing them separately I shall consider the treatment of the entire group.

Enteralgia.—In certain conditions of the system, especially in lithæmia, or what the French call arthritism, as well as in malaria, gout, and syphilis, you may possibly encounter neuralgia in any nerve of the body, including, of course, those of the stomach and in any part of the intestines. The different plexuses of the abdominal sympathetic are often thus affected, and Max Buch¹ maintains that so-called enteralgia is really always situated in some one of these. The pain may be very acute and severe, or merely a dull, wearying ache, which interferes with the patient's sleep. Acute pain in any part of the abdomen may be attributed to neuralgia, when there is no fever or other sign of inflammation, no tumor, and no accumulation of flatus as in colic. While, in the latter, pressure most commonly relieves the pain somewhat, there will usually be in enteralgia some tenderness on deep pressure, especially over the position of whichever nerve plexus is involved; but the diagnosis between a pure enteralgia and colic cannot always be made. You should avoid mistaking for enteralgia especially malignant growths in which pain is likely to be rather constant, while that of the former is usually paroxysmal; also chronic appendicitis in which the tenderness is commonly located in or near the cecal region and is nearly always accompanied by an unusual tension in the right rectus muscle. In hepatic colic there is usually at least beginning jaundice with pale feces and high-colored bile-stained urine, while the pain is situated in the region of the gall bladder. In renal colic, the pain shoots down along the course of the ureter and is nearly always accompanied by a frequent desire to urinate. In movable kidney there may be attacks of acute pain, but the situation of the pain is then below the liver, in front (more likely therefore to be confounded with that of gall-stone colic), and with a little practice you may easily palpate the kidney in its abnormal position. Besides, when a displaced kidney is painful, it will usually be tender as well as somewhat swollen.

¹ *Arch. d. Verdauungskrankh.*, ix. 4 and 5.

Intestinal Colic.—This disease is so often seen by every practitioner as scarcely to need description. The conjunction of violent paroxysmal pain, with a manifest accumulation of gas and constipation, following as a rule some indiscretion in diet, is a familiar picture. The pain is intense, and may usually be relieved somewhat by pressure over the abdomen. Colic or cramp pains, whether in the stomach or bowels, are caused by some irritant. This may be in severe cases any cause of obstruction as hardened feces, gall stones, worms, etc., but is most frequently indigestible food or an excessive amount of acid, either the HCl of the gastric juice (which is very often the irritant) or the organic acids resulting from fermentation. As a result of such irritation there ensue, instead of the normal relaxation of one part of the gut while the part immediately above contracts, irregular contractions which do not yield to the peristaltic waves. In consequence, the propulsive efforts are greatly increased in force and frequency. The bowel contents are violently driven on into the narrowed part, thus giving rise to intense pains.

The absence of fever differentiates intestinal colic at once from the more serious inflammatory affections, and the differential diagnosis from the more frequent non-inflammatory causes of abdominal pain is much the same as in the case of enteralgia. From lead colic it can be easily distinguished by the absence of any tympany as well as by the presence usually of a blue line on the gums in the latter.

Enterospasm involving either all the intestines, or all except the colon, is very rare except as a result of basilar meningitis or lead poisoning. In the latter there is usually a particularly severe colic, as well as a blue line at the junction of the gums with the teeth, so that this form of the malady should be easily recognized. In enterospasm dependent upon meningitis, there is nearly always at least a slight rise of temperature, which should help you to differentiate it. There will be also a peculiar hyperæmia of the skin in most cases, so that when the finger, or especially the finger nail, is drawn quickly over the

surface of the body, a red streak remains for some seconds along its course. The typical retraction of the abdomen with marked depression in its center, called "boat belly," is seen most perfectly in enterospasm resulting from meningitis, though it is often also well marked in lead poisoning. In the exceedingly rare cases of supposed enterospasm described in medical literature which were not dependent upon either of these two diseases, there does not seem to have been a marked general contraction of the abdomen. In enterospasm, there is, as a rule, very obstinate constipation—obstipation—but in the partial or milder types of the affection which form the basis of chronic spastic constipation, there may be bowel movements of a peculiar character, either very small and slender—lead-pencil-sized stools—or little hardened balls like bullets or marbles.

You will rarely, if ever, meet with a case of enterospasm from purely nervous causes, not a result of either meningitis or lead poisoning, but such have been observed by Ewald and by Hemmeter, among others. Some of the reported cases, however, were complicated with spasmodic pain and could be classified under Intestinal Colic, except that there was retraction of the abdomen instead of tympany, as is usual in colic. In any such case we cannot positively exclude lead colic, since the blue line on the gums is often wanting in persons—plumbic patients—who take good care of their teeth, while the other signs of lead poisoning may often fail us, and there may be nothing in the most carefully developed history to suggest that origin in some of the worst cases of such poisoning. Localized spasm in some one or more parts of the bowel produces spastic constipation without any marked appearance of abdominal retraction.

Meteorism, Tympanites, or Flatulency.—Colic might have been described as enteralgia or pain in the bowels plus a gaseous distention of them, and the commoner forms of meteorism may be defined as a gaseous distention without the violent paroxysmal pain which is characteristic of colic. Still

there is usually much discomfort or dull pain in meteorism, and when the condition is due to inflammatory causes as appendicitis, peritonitis, etc., the pain may be severe.

The cause of meteorism may be:

1. A local obstruction, such as a twist or displacement involving a kinking of some portion of the intestine, intussusception or invagination, a contraction with narrowing of the lumen from the cicatrix of an ulcer, the pressure of a tumor or displaced kidney, inflammatory adhesions attaching one coil of intestine to another coil or to some other organ, a blocking of the bowel by a large gall stone or by a mass of hardened feces, or hernia, appendicitis, peritonitis, typhoid fever, etc., spastic contractions producing constipation, or constipation from any cause.

2. The excessive formation of gas in either the stomach or intestine through fermentation or putrefaction, with the addition of the gas in any effervescent beverages ingested, and increased possibly in some cases to a certain extent by swallowed air.

The suggestion that air sucked in through the rectum may be responsible for some cases of excessive distention of the intestine seems too ridiculous for serious consideration.

3. An unquestionably important factor in the ætiology of meteorism in many cases, if not the chief cause, is atony of the bowel wall, which allows even the normally small amount of gas formation to produce an undue distention, and at the same time retards the onward propulsion of the bowel contents.

4. Deficient absorption of gases through some defect in the mucosa may be a cause of excessive tympany, though it is difficult to prove this beyond question.

The symptoms of meteorism include constipation, marked distention of the abdomen, which in severe cases becomes barrel-shaped, and, in its worst forms, pain which is usually dull and constant rather than paroxysmal. When the distention is extreme the stomach and diaphragm are pushed upward against the heart, and there is then often vomiting as well as

possibly palpitation, dyspnea, and sometimes even faintness or collapse.

Diagnosis.—Percussion gives a loud tympanitic note all over the abdomen, including the sides, where in ascites there would be dullness instead. Then in the middle line the abdomen is high and rounded instead of flattened there with prominent bulging at the sides, as there would be in ascites. Furthermore, in tympanites no wave of liquid can be driven across from one side to the other by a tap from one hand, so as to be felt as an impact by the other hand while palpating on the opposite side. It must not be forgotten, however, that in peritonitis, especially when it results from the escape of the gastric contents through a perforated ulcer, liquid may be demonstrated in the abdominal cavity on one or both sides, the tympanites being then only one symptom of a serious complicated condition.

In simple meteorism, not a result of perforation with escape of gas into the peritoneal cavity, the liver may be pushed upward so that its zone of dullness is higher than normal, but the latter is rarely entirely obliterated, as it is when there has been perforation of the stomach or intestines. Absence of the usual liver dullness may be produced also by the displacement upward of a much distended colon, so that too much importance should not be attributed to this sign.

PERISTALTIC UNREST; ATONY AND PARALYSIS OF THE INTESTINES

Peristaltic unrest of the intestines is in all respects analogous to peristaltic unrest of the stomach. When a mere neurosis it affects predominantly the same class of persons—those possessing an unstable nervous system—but may be encountered also in strong persons as a result of inflammatory disease or any mechanical cause of obstruction to the onward propulsion of the feces.

As in the stomach, peristaltic restlessness in the intestines consists of excessive or exaggerated peristaltic movements,

which in thin persons can often be seen or felt by the palpat-ing hand.

The aetiology can be various. The affection is generally classed among the neuroses, and nervous causes are supposed to be sufficient alone to produce it; but it is a curious fact that, though the essence of the trouble is excessive peristalsis, it is only exceptionally seen in diarrhea, when the exciting cause of the latter doubtless produces it, but, on the contrary, is nearly always associated with constipation, which it is supposed to cause. I hope not to be condemned as hopelessly heterodox if I venture to suggest that the constipation may be the primary condition—the cause—and the neurasthenic state and associated peristaltic unrest may be results.

In addition to the nervous cases, it is well understood that any of the numerous forms of intestinal obstruction which have been already discussed may be, and usually are, accompanied by peristaltic unrest.

The symptoms in the milder cases include merely the consciousness of excessive movements in the intestines, or actual discomfort produced by them, together with the gurgling and rumblings which are audible both by the patient and others. As a rule, the trouble is not persistent, but occurs in recurrent attacks which may last for variable lengths of time, but usually for a few hours only. In some cases the discomfort of the unusual movements increases to actual pain, and severe cases of this kind are scarcely to be diagnosed from intestinal colic, especially when some tympanites is also present. Most authors have observed that the affection occurs chiefly in nervous persons, especially in women, and in the latter is worse at the monthly periods as well as during pregnancy.

The diagnosis can only be made from the above-mentioned symptoms, especially by seeing or feeling the exaggerated movements. The neurotic form may be distinguished from those cases due to intestinal obstruction by the comparative mildness of the symptoms, and especially by the fact that they do not persist right along as do the latter, but have periods of

remission, and usually cease whenever the patient's attention is diverted by spirited conversation or any engrossing occupation.

Paralysis of the Intestines.—This disease may be a neurosis, but, as most frequently encountered, is a consequence of certain anatomic lesions, mostly surgical affections. For the sake of convenience the whole subject shall be here briefly considered.

Complete paralysis of the intestines generally is rare, and is a result either of diffuse peritonitis, or of some central nervous disease, such as tumors of the brain or cord, meningitis, locomotor ataxia, myelitis, hysteria, melancholia, etc. Exceptionally it may result reflexly from traumatism in some of the more sensitive sexual organs—ovaries or testicles—through operation or accidental injury.

Paralysis of a single coil or small part of the intestines is often seen and may result from a local peritonitis, abscess, severe enteritis, appendicitis, replacement of a hernia, an accumulation of hardened feces, volvulus, intussusception, displacement of almost any of the viscera (especially when kinking is thus produced), tumors, obturation by a large gall stone, and in short any of the mechanical or other causes which can obstruct the lumen of the intestines when such a cause persists long.

The symptoms are extreme meteorism, obstipation, eventually vomiting (often of fecal matter), pain, great restlessness, cardiac palpitation, weakness, and, unless relief can be afforded, collapse and death.

The diagnosis of intestinal paralysis can be made when extreme meteorism exists in the absence of any discoverable cause of obstruction, or persists for many days in spite of the removal of the obstruction. Indeed, since obstruction of the bowel can finally lead to paralysis, this condition may be inferred when a high degree of meteorism persists long, because of the non-removal of the obstruction.

Prognosis.—Paralysis of the intestines, or any part of them,

can usually be cured when the cause can be completely removed within a short time—a few days. But when the primary disease or mechanical obstruction is irremediable, there can naturally be no hope. When the cause has persisted very long, even its removal will not be likely to be followed by a return of power to the intestinal muscles.

The Treatment of the Intestinal Neuroses.—In all of the true neuroses, however manifested, the primary indication must be to strengthen in every way the weakened nervous system. You must treat the neurasthenia or hysteria which is the fundamental disease. The most efficient therapeutic measures and medicines for this purpose have already been frequently discussed in this series of lectures, especially under the heading of the Treatment of Nervous Dyspepsia, but the subject is so important that the principal remedies will be here again summarized.

The therapeutic means which are of universal application in all such cases are:

1. All enlivening and encouraging psychic influences.
2. A generous and nourishing diet, as abundant and varied as the patient's digestive powers and purse will permit.
3. The inhalation of as much of a pure, bracing, outdoor air (outside of cities when practicable) as can be taken into the lungs, though in the worst cases of neurasthenia it needs often to be inspired while the patient is resting in a recumbent position, rather than exercising.
4. A full or even extra-large amount of sleep, not forced by hypnotics, though the use of nerve tonics or even the cautious administration of the milder stimulants to favor this is often permissible, or even advisable, since the former especially may assist in other ways the work of improving the lowered nerve tone.

In addition to a general tonic treatment, enteralgia, colic, enterospasm, and cases of meteorism or flatulency, not dependent upon any serious form of obstruction, all call for combined sedative and aperient remedies. In the first three af-

fections in all of which pain is the predominant symptom, and often the cause of intense suffering, an efficient dose of some powerful anodyne, preferably in most cases morphine and atropine (grn. $\frac{1}{4}$ of the former with grn. 1-80 of the latter), should be promptly administered hypodermically in cases in which the pain is violent, and repeated in twenty to thirty minutes if there has been no relief. Then it is often desirable to order further amounts of the same remedies in doses twice as large, to be administered in the form of suppositories by the rectum. This is more efficient in intestinal pains than corresponding (half) doses by the mouth, and is much less likely to disturb the stomach.

I have often been obliged in severe colics to inject hypodermically $\frac{1}{4}$ grn. of morphine combined with atropine as above described, before the pain could be controlled. But until you have tested the tolerance of a patient for the drug, it is best not to give over $\frac{1}{4}$ grn. of morphine at a dose, and it is not wise in any case to inject more than $\frac{1}{2}$ grn. at a time. While the pain is thus being relieved, it is necessary in most cases to administer remedies designed to unload the bowels. When there is no nausea or vomiting, castor oil, or some such disguised preparation of it as Laxol, will succeed best given in doses of f $\bar{3}$ ss. to f $\bar{3}$ i; or you may prescribe instead some agreeably flavored saline, such as a pint bottle of the familiar effervescent solution of magnesia, taken gradually to avoid nausea, or the following prescription:

℞ Magnesiae sulph..... ℥ ii
 Succī limonis..... f ℥ i
 Aq. menth. pip..... q. s. ad f ℥ iv
 M. Sig. Teaspoonful in water (preferably carbonated) every half-hour till it acts.

One or two compound cathartic pills may answer instead of the purgatives mentioned, though they must often be repeated, and are too slow in acting for the worst cases. In the latter the quickest and most efficient means of emptying the colon is by copious enemas of hot normal salt solution or warm soap

suds alternated with enemas of olive, linseed, or cotton-seed oil, f3iv to f3vi, injected preferably through a long flexible tube, though the ordinary apparatus will answer, if the patient lies first on the left side with the hips raised, and after a few minutes is directed to lie on the right side, while the colon is kneaded in the reverse direction to carry the liquid over into the cecum.

A very soothing and helpful adjuvant in all these cases characterized by either pain alone, or pain, spasm, and constipation, is the application of hot mush or flaxseed-meal poultices, or hot wet compresses over the entire abdomen, changed as soon as they become cool.

To prevent the recurrence of such attacks, besides the always indispensable tonic measures addressed to the nervous system, great attention should be given to securing regular and sufficient bowel movements by diet and exercise—active or passive, or both according to the strength of the patient—aided when necessary by oil enemas, and when not otherwise contra-indicated, by massage, electricity, and hydrotherapeutics. (See lectures on Constipation.)

When either colic or meteorism is due to obstruction of the bowel, this primary affection must receive the chief attention. (See lecture on Intestinal Obstruction.)

Treatment of Peristaltic Unrest of the Intestines.—This affection, when it proceeds from nervous causes, needs the same roborant measures appropriate to other phases of neurasthenia, and sometimes in addition the milder nerve sedatives, such as the bromides, valerian, scutellaria, gelsemium, cimicifuga, asafetida, sunbul, etc. The bowels should be kept open by hygienic means as advised above. More serious causes, such as intestinal obstruction, demand the treatment appropriate to the primary affection.

Treatment of Paralysis of the Intestines, when partial and due to inflammatory disease or mechanical obstruction, requires the measures necessary for the cure or relief of such affection. After this has been accomplished, or at once in cases

attributable to general depressing conditions, remedies designed to strengthen the intestinal musculature will be in order. Strychnine internally or hypodermically, massage and electricity locally with often one pole in the rectum, and sometimes, though not in very weak patients, cold douches or affusions to the abdomen, will be suitable unless contra-indicated for any reason because of the nature of the exciting disease. None of these would suit when the bowels are obstructed by spastic contractions, nor, with the possible exception of the strychnine, in any acute inflammation. Care must be taken to have the bowels open daily without unduly irritating the weak musculature, preferably by the use of oil enemas, and the diet must be nourishing and digestible without being either too bland or too disturbing.

LECTURE LXXIX

DISEASES OF THE RECTUM AND ANUS

It would be impossible, in the limited space allotted to the subject in this book, to attempt a full discussion of those conditions of the rectum which are influenced by disturbances of the digestive functions, or which, in turn, affect the nutritive or digestive processes. An attempt will be made to review briefly the more common affections of the rectum and anus as met with in general practice, and to indicate such methods of treatment as have been found of service to the writer, especially methods which can be employed by the general practitioner not having access to a hospital with its fully equipped surgical paraphernalia. The accepted methods of operative procedure in given cases will be briefly reviewed, but for the full description of the technique, the reader must be referred to the more complete writings dealing with that special subject.

Fortunately, in recent years, more attention has been paid to the important relation the rectum bears to the general gastrointestinal tract, and it is to be hoped the day will soon be numbered with the past when a long-continued enteritis or colitis will be treated without a careful rectal examination. Should a case present with definite rectal symptoms, a local examination ought to be made before any treatment is instituted. No sensible patient should refuse to have this examination made, and no physician, however strongly convinced of the diagnosis from the symptoms stated, should allow himself to be lulled into a sense of false security and prescribe for that case until, by careful local examination, the diagnosis has been verified. When a patient tells you that he has an attack of the "piles," his diagnosis is of about as much value as that of an old countrywoman who had a bad attack of cystitis, and

who told her doctor that she had "an awful pain in her stomach." The plebeian, but correct term, "piles," may be used to express any rectal condition from a simple fissure to carcinoma, such is the dense ignorance on the part of the average layman as to things rectal.

For the sake of brevity a discussion of the anatomy and physiology of the rectum will be omitted, and only such mention of the subject will be made as is absolutely necessary for the clear understanding of any particular condition.

EXAMINATION OF THE PATIENT

When a patient presents himself for treatment it is very important to obtain a clear history of the case. This is best accomplished by first allowing the patient to give a recital of his symptoms in his own words, beginning with the time when he first became aware of any abnormal rectal condition. Do not interrupt by asking any questions, for the man will naturally lay stress upon the symptoms which appear to him most important, and much valuable information may be gained from hearing the symptoms detailed in this manner. Oftentimes a premature question put by the examiner will force the patient into placing too much importance on some insignificant or misleading symptom. After the patient has completed his story, the time has arrived to ask leading questions so as to arrive as nearly as possible at an accurate diagnosis of the case, but a positive diagnosis is an impossibility without a carefully instituted examination, the history simply indicating what is to be looked for, and helping one to find obscure conditions which might otherwise be overlooked.

The Symptoms and Their Significance.—The most prominent symptom usually complained of is *pain*, for unless this be present the patient rarely consults a physician and it is by relieving this one symptom, by correcting or removing the cause, that the professional man earns for himself the gratitude of the sufferer. Unfortunately, recourse is only too often had to the use of opiates, and too often, either from ignorance or a

mistake in judgment, the foundation is laid for the acquirement of the opium or cocain habit. Right here let me say that the use of opium is hardly ever indicated for the relief of rectal pain. If the cause can be ascertained it can usually be removed by very simple means, and then the mistake is not made, as is often done, of masking very important guiding symptoms.

The time, duration, and character of pain are very important. If felt during stool, it would suggest strangulation of anal tissues, hemorrhoids, abscess, or ulceration. If it should begin after stool, it would point to the presence of fissure, while, if it is continuous and of a throbbing character, abscess formation may be suspected.

Bleeding, during stool and immediately after, would indicate internal hemorrhoids, ulceration, or malignant disease. Occasionally there may be a little bleeding from a fistulous tract. In children the presence of blood in the stools would suggest the existence of a polyp.

Itching, as a symptom, occurs with aggravating frequency. This may be a mild, fleeting, and almost a pleasurable sensation, or it may be present in such an aggravated form as to render the life of the patient almost unbearable. Nearly any rectal condition may produce itching as a reflex symptom, but as a rule the correction of the cause removes the trouble. Unfortunately, in cases of pruritus ani of the more pronounced type the physician will find that he has a very grave and stubborn condition to deal with.

Protrusion from the anus is usually a prolapsed internal hemorrhoid, a polypus, or a prolapse of a portion or all of the rectal coats.

Swellings at the margin of the anus may be due to strangulation of an hypertrophied anal margin, thrombotic external piles, anal condylomata, abscesses, fatty tumors, or malignant growths.

Constipation, while a symptom, is of such frequent occurrence, and of such importance, that it has come, in the lay

mind at least, to be regarded as a distinct disease, or at least an unpleasant abnormality. It is the hobby-horse of the quack, and the stumbling-block of the regular practitioner. Its rectal relations will be dealt with in another portion of this lecture, and the subject of constipation in general is considered in Lectures LXIX. and LXX.

Diarrhea is also a term loosely applied to discharges from the rectum of undue frequency or liquid formation, whether feces, mucus, blood, or pus. If feces, the trouble is rarely of local origin, but mucus, blood, or pus may originate anywhere along the intestinal tract, and the location of the trouble should be diligently searched for. Hemorrhage may follow any ulcerative condition of the intestine, as in typhoid or tubercular ulceration, or that ulceration taking place in the later stages of malignant disease. If the bleeding be from any point in the small intestine, the discharge will contain clots of blood, mixed with feces, and show evidences of partial digestion. If the clots are large and undigested, the hemorrhage has either been very free, or the bleeding has occurred at some point in the colon or rectum. Should the bleeding be free at stool and contain few clots, the cause is probably to be found in the rectum and is due to the conditions mentioned under hemorrhage.

Mucus may result from almost any catarrhal condition of the large or small intestine, from polypoid growths, or simply from a localized rectitis due to local irritation. *Pus* in the stool may also occur as a result of high ulceration or the rupture of an abscess into the bowels, or it may be of local origin, as from ulcerated hemorrhoids, perirectal and ischiorectal abscess, or from carcinoma of the sigmoid or rectum.

It is also well to bear in mind such symptoms as cough, rapid loss of weight, skin eruptions, temperature, respiration, and pulse, as they may have a bearing upon the general condition of the patient, suggesting phthisis, specific disease, or malignant development.

Technique of the Examination.—The most satisfactory

method of examining patients is to place them on a lounge or operating table in the left lateral posture, with the knees drawn well up, the right knee a little higher than the left, and the buttocks well over to the edge of the table. The light should be direct, daylight being preferable to artificial light. This posture has the advantage over others that with it there is less exposure of the person, a very important consideration when dealing with a female patient, and also it is a very comfortable position, especially when the examination occupies a considerable length of time. There are few rectal conditions where any other position for examination is either necessary or desirable.

Inspection of the Anus, etc.—Before any examination of the rectum itself is made, a careful inspection should be made of the anus and surrounding tissues. The skin should be examined for abnormalities, such as redness, cracks, swellings caused by thrombi, inflamed anal folds, ulceration, or the openings of fistulous tracts. Particular notice should be taken of the anal aperture. Normally the anus should appear as an antero-posterior slit, about one inch in length, and the line only broken by a few normal corrugations. Upon separating the buttocks, should the aperture appear round or funnel-shaped, spasm of the sphincter, due to some irritation, is undoubtedly present. This condition is most pronounced in cases of fissure of the anus. The anal opening may be occluded by a prolapsed polypus, or internal hemorrhoids, or the lower extremity of a fissure may be seen.

In patients suffering from paresis and locomotor ataxia, there is frequently noted a loss of tone in the sphincter reflexes. When the finger is inserted into the rectum the sense of contraction around the finger is very slight, while if a little lateral pressure is made, the sphincter relaxes easily, allowing the anus to gape open. In the advanced stage of these diseases this relaxation increases until incontinence results. The condition seems to be due, possibly, to the diminution of tactile sensation in the internal sphincter, associated with paralysis of the external sphincter.

The Digital Examination.—After carefully noting all external anal conditions, a digital examination should be made. Lubricate the index finger either with petrolatum or other lubricant, introduce it gently into the anus, overcoming the normal resistance by firm but gentle pressure. The finger should never be introduced with undue haste, as uncomfortable and often painful spasm of the sphincters is produced thereby. In a normal anus the finger should slide in easily, and when at rest, there should be very little sensation of constriction caused by the rhythmic contraction of the muscle about the finger. By means of tactile sensation, the trained finger can diagnose most of the local diseases affecting the lower portion of the rectum, as for instance, fissure, the internal opening of a fistula, polypoid growths, fibromata, malignant neoplasms, stricture, deep ulcerations, foreign bodies and fecal impaction occurring in the rectum, fluctuation, or points of abnormal tenderness. Internal hemorrhoids cannot be accurately diagnosed in this manner. It should be borne in mind that the finger is the best instrument for diagnosis, while a speculum is of chief value only to verify conclusions, to diagnose internal hemorrhoids, and particularly is it an instrument to assist in local treatment of the rectum. For pathologic conditions beyond the reach of the index finger, a speculum is necessary.

The More Important Instruments Required.—The speculum I find most convenient for routine use is the small conical form designed by Dr. Robert W. Martin. It will be noticed by referring to the accompanying figure that the rectal end is cut off at an angle of 45° . A small wire bead is added to this edge to protect the tissues from injury and also to add to the comfort of the patient while rotating the speculum in the rectal cavity. The angularity of the distal end is for the purpose of allowing the side of the rectal wall to prolapse into the aperture, so that a distinct view of the mucosa may be obtained. By rotating the speculum, every portion of the rectal mucosa of the lower two inches can be closely inspected. The

speculum is of course introduced with the obturator in place, and as much care should be used in the introduction as was used in passing the finger into the rectum. There are several

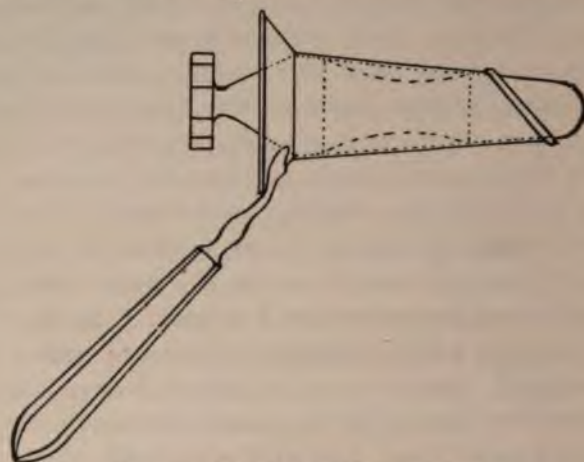


FIG. 99.—Martin's conical speculum.

good forms of bivalve specula on the market, but while they may be useful in some cases, they have the disadvantage that they cannot be rotated in the anus without great pain and dis-



FIG. 100.—Bodenhamer's bivalve speculum.

comfort to the patient, but have to be reintroduced every time a new section of the rectal cavity is to be examined.

One of the most convenient forms is that designed by Bodenhamer, a cut of which is shown.

While it must be borne in mind that a large percentage of rectal conditions can be diagnosed simply by digital examination followed by the use of a small speculum, there are other diseases of the upper rectum and sigmoid for the diagnosis of which an extra-long speculum or pneumatic proctoscope is necessary.

Dr. Tuttle has kindly permitted me to use the cut of his proctoscope, and I have taken the liberty of quoting the excel-

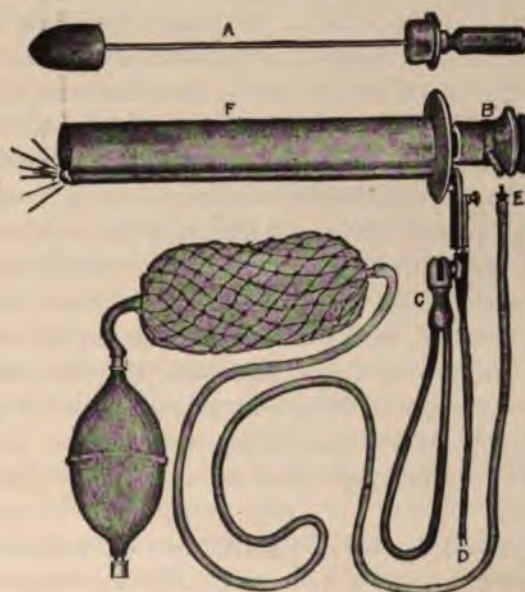


FIG. 101.—Tuttle's pneumatic proctoscope.—*A*, obturator; *B*, plug with glass window closing end of tube; *C*, handle; *D*, cords connecting instrument with battery; *E*, inflating apparatus; *F*, main tube of proctoscope.

lent description of it given in his book on the "Diseases of the Anus, Rectum, and Pelvic Colon."

"This instrument is composed of a large cylinder (*F*) into one part of the circumference of which is fitted a small metallic tube, closed by a flint-glass bulb at its distal end. The electric lamp is fitted upon a long metallic stem, and carried through

the small cylinder to the end of the instrument, as is shown in the illustration.

“ The proctoscope is introduced through the anus with the obturator (*A*) in position. As soon as the internal sphincter is passed, this obturator is withdrawn and the bayonet-fitting plug (*B*), which contains either a plain glass window, or a lens focused to the length of the instrument to be used, is inserted in the proximal end of the instrument. This plug is ground to fit air-tight, and thus closes the instrument perfectly. The plug being inserted in the tube, a very slight pressure upon the hand-bulb will cause inflation of the rectal ampulla to such an extent that the whole rectum can be observed, and the instrument can be carried up to the promontory of the sacrum without coming in contact with the rectal wall. Further dilatation will show the direction of the canal leading into the sigmoid, and by a little care in manipulating the instrument, and keeping the gut well dilated in advance, it can be carried up into this portion of the intestine without the least traumatism of the parts. If any fecal material obscures the light by being massed or smeared over the glass bulb, the plug can be removed, and a pledget of cotton introduced with a long dressing-forceps, to wipe this off, so that the plug can be reintroduced and the examination continued with very slight delay or inconvenience.

“ The adjustable handle (*C*) fits on the rim of the instrument and thus converts it into a Kelly tube. This instrument is operated with an ordinary dry battery of four cells.”

In the following pages the more frequent rectal diseases will be briefly discussed. It is not intended to review all the accepted operative procedures, but rather to indicate such surgical and medical treatments as may be carried out in the office of the general practitioner or in the patient's home. The methods indicated are such as may be applied to that large class of patients who either will not or cannot be treated in a hospital.

THE RECTAL RELATIONS OF CONSTIPATION

The causes of constipation are either general, depending upon some abnormal state of the digestion, obstruction of the bowel, or disease in some portion of it; or local, resulting from some anomalous anatomic condition of the rectum, or upon pathologic processes in or about it. The general or digestive conditions causing constipation have been fully discussed in Lectures LXIX. and LXX., so that the local rectal factors only will be considered here.

Anatomically, constipation or obstipation may be caused by an abnormal formation of the rectal valves, as pointed out by Martin of Cleveland, who has done much to clear up the ætiology of these conditions.

A frequent local cause of constipation is an abnormal irritability of the sphincter muscles, causing a loss of the normal relation between the expulsive power of the rectum and the cut-off action of the sphincters. Congestion or inflammation of the rectum or anal tissues causes an increased irritability of the sphincter muscles due to excitation of the nerves supplying those organs; thus we frequently find constipation as a symptom in cases of internal hemorrhoids, external hemorrhoids, fissures, abscesses, or ulceration of the rectum. Prostatic congestion and hypertrophy are often important factors. Other cases are due to local obstruction, as in benign or malignant stricture, or the presence of tumors or foreign bodies in or about the rectum. In women, the pressure upon the rectal wall of an enlarged uterus, or tumors connected with the uterus, forms a very troublesome complication when we try to relieve this condition. There are also some cases in which the constipation is due to paralysis or loss of tone on the part of the rectal and accessory muscles of defecation.

The Operation of Divulsion.—One of the most efficient means of treating these spasmodic cases is the employment of divulsion or rapid dilatation of the sphincter under general anæsthesia. Rapid divulsion is of value from the fact th

the nerves supplying the muscles undergo the process of nerve stretching, thereby lessening the irritability and improving the venous and arterial circulation of the muscle.

Nitrous oxide has many advantages over other anæsthetics for this purpose, as the sphincteric reflexes are retained, thereby furnishing an index as to the amount of force required. The operation can be as readily performed under *ethyl chloride anæsthesia*, the tubes of ethyl chloride being very convenient to carry in the emergency case. Divulsion should be manual and not instrumental, thereby avoiding the danger of undue laceration of the muscle. The sphincter should be stretched to its utmost, till the fibers just begin to give way, care being taken not to tear the muscle. This operation need not confine the patient to bed, but may be performed in the office.

When any extensive surgical operation is to follow, the divulsion should be performed under the influence of ether or chloroform, bearing in mind that the reflexes are then absent; therefore much more care and time are required in the performance of the operation.

Under nitrous oxide or ethyl chloride, a good divulsion can be obtained in from thirty to fifty seconds, while under the other anæsthetics several minutes should be consumed in carefully kneading the muscle until it is thoroughly relaxed, very little force being employed. In about 70 per cent. of cases suffering with rectal troubles and constipation as a symptom, divulsion and appropriate treatment of the local conditions will completely cure the constipation.

It may be well to add that the stretching of the muscle in itself will in nearly every case relieve any local pain in or about the rectum, and, from the improvement in the circulation, materially hasten the cure in the majority of cases. Divulsion is indicated in all cases where there is marked inflammation, strangulation, pain, or hemorrhage of the rectum, the only contra-indications being paralysis of the sphincters and malignant disease situated near the anal orifice.

FECAL IMPACTION

Impaction of feces in the rectum may be due to catarrhal conditions of the colon, muscular atony giving rise to sluggish peristalsis, dilatation, and sacculation particularly of the sigmoid and rectum, and arrested foreign bodies in the bowel, such as seeds. Should the feces become stopped at any portion of the colon, the watery constituents are absorbed, leaving a firm residue, rich in lime salts, glued together by mucus and the compressing muscular action of the bowel. This mass shows a marked tendency to adhere to the walls of the gut, and may produce considerable local irritation, followed in some cases by ulceration and hemorrhage.

The early symptoms are constipation, partial or absolute, followed suddenly by diarrhea. The stools are liquid and frequent, with a marked tendency to tenesmus. If the condition is pronounced, there may be considerable auto-intoxication, with flatulence and a sense of abdominal fullness. Should the impaction be in the sigmoid, palpation may reveal a doughy tumor in the left groin, with tympanites over the colon above.

In the rectum, the mass can usually be felt upon digital examination. Pain in the back, rectum, and anus is a frequent symptom. The diarrhea is caused by irritation of the mucous membrane inducing an excessive production of mucus. Added to this, the liquid contents of the bowel above the impaction may insinuate themselves along the side of the fecal mass or, in a few instances, may make a canal directly through it, and thus pass down the alimentary canal. If there is any ulceration, the stool will be tinged with blood.

The treatment of impaction consists in the removal of the arrested fecal mass followed by treatment of the irritation of the mucosa from the unavoidable traumatism, and finally, the correction of the primary cause, if this be a colitis or atony of the muscular coats of the bowel.

Where the feces are lodged in the rectum, a divulsion may l

performed, when the mass can be turned out with the fingers or broken up and removed with a rectal scoop. If the collection is in the sigmoid, or is too large or too hard to remove through the anus, Tuttle advises an injection of $\frac{1}{2}$ pint of warm water, to which has been added 3 ii of inspissated ox-gall and 3 i of glycerin. This should be retained as long as possible, and repeated four times in twenty-four hours. The mass will then usually be soft enough to pass the anus after a large enema, associated, if necessary, with a large dose of castor oil.

Dilatation of the rectum and colon with air, either by means of the pneumatic proctoscope or a simple rubber valve syringe, will frequently assist in dislodging the impaction, especially when assisted by gentle massage of the abdomen over the tumor. After the rectum has been emptied, the patient should be given a laxative, preferably castor oil or magnesium sulphate, followed by the internal administration of such peristaltic stimulants as eserine or strychnine.

The patient should make a daily practice of drinking plenty of water and taking regular exercise. Should any symptoms of constipation again appear, relieve the bowels with a saline laxative.

Should there be any local ulceration in the rectum or sigmoid, it will usually yield to a daily irrigation with warm normal salt solution. This injection will often relieve the condition of shock which sometimes follows the rapid removal of the retained feces and gas. Internally, ichthyol, grns. 5, three times daily, seems to exert a very soothing effect on irritations in the upper portion of the colon.

HEMORRHOIDS

Varieties.—Hemorrhoids may be classified as either external or internal, depending upon whether they have their origin below or above the external sphincter. Of the external, there are practically only two varieties, the *thrombotic pile*, consisting of a clot of blood in one of the inferior hemorrhoidal veins,

or else a clot resulting from the rupture of one of these veins just beneath the skin. These are easily recognized by their purple color and shot-like hardness to the touch. The simplest and most effective treatment for this condition is to inject a few drops of a 2 per cent. solution of cocain, transfix the clot with a curved bistoury, turn it out, stop bleeding by pressure forceps, or by torsion, and pack the cavity with iodoform gauze kept in place by a T bandage. Healing will be complete in a few days. The practice of using sutures in or around the anus and rectum is to be condemned, except under the most ideal aseptic conditions, and, even then, infection along the line of suture is very apt to take place, resulting inevitably in the formation of a fistula.

The second variety of external hemorrhoids may be classified as hypertrophies of the anal margin. These may be either inflamed, œdematous, or composed principally of connective tissue. For the inflamed and œdematous varieties, a simple divulsion of the sphincters, followed by the application of hot compresses for ten minutes at intervals of two hours, will usually result in almost immediate relief. The folds rapidly decrease in size, and if necessary they can be scissored off under local anæsthesia at some subsequent period. The connective-tissue variety rarely give any trouble, and may be disregarded unless they become inflamed, when they should be treated as the preceding.

Internal hemorrhoids may be classified under the following five varieties, *thrombotic*, being merely a clot in a superior hemorrhoidal vein; *varicose*, or *venous*, being a varicosity of the primary branches of the superior hemorrhoidal veins; the *arterial*, which are relatively rare; the *capillary*, which are small piles composed of enlarged venous and arterial capillaries and bleed upon the slightest touch; and the *fibrous hemorrhoid*, or *polypoid pile*; this last variety being simply a varicose pile which, from repeated attacks of irritation and inflammation, has hypertrophied, resulting in the deposition of an excess of fibrous tissue. The mucous membrane on the

surface has, from this irritation, undergone a polypoid degeneration, and as a result there may be a profuse discharge of mucus from the pile.

The *symptoms of the thrombotic variety* are pain in the rectum coming on suddenly, usually after some straining at stool, accompanied by a sense of fullness or a feeling as of a foreign body in the rectum. Generally there is considerable sphincterismus, accompanied by constipation. The clot can easily be felt upon digital examination, usually just at the upper border of the internal sphincter. *The treatment* consists in divulsion of the sphincter and turning out of the clot after transfixing it with a long, curved bistoury. An application of stick nitrate of silver will usually stop what little bleeding is present, or the cavity may be packed with a small pledget of cotton saturated with adrenaline chloride, 1-1000. The treatment may easily be performed through the small conical speculum and local anæsthesia is rarely necessary, as the rectal mucosa above the sphincter is not very sensitive. A 5-grain iodoform suppository may be used after bowel movements, and one may be inserted at bedtime for a few days. The bowels should be moved every day, with the aid of a mild laxative if necessary.

Varicose and capillary hemorrhoids produce, as prominent symptoms, bleeding at stool, a sense of fullness at stool, constipation, and, in the more advanced cases of the varicose variety, protrusion of the piles, which may reduce themselves spontaneously or may have to be replaced manually. Should these hemorrhoids not be replaced immediately, and spasm of the sphincters occur, strangulation is almost sure to follow, attended with great pain, swelling, or œdema of the anal margin, and, in some cases, sloughing of the rectal or anal tissues. Some of the more aggravated cases are complicated by the formation of a submucous or marginal abscess. If the patient refuses any cutting operation, by far the quickest means of relieving the symptoms is by immediate divulsion under nitrous oxide, followed by the application of hot compresses.

The case may subsequently be treated either palliatively or by the injection method.

The Injection Treatment of Hemorrhoids.—This has in the past been brought into disrepute because employed by quacks and physicians unacquainted with the proper technique and unable to cope with the complications resulting from improper methods. In the experience of the writer, it is not only a safe procedure, but the results obtained earn for it a position as a recognized and satisfactory method of treatment. Its advantages consist in the fact that the patient is not confined to bed, the treatment is practically painless, the complications are few, and the results compare very favorably with those following other operative methods. Recurrences are rare, and when they do occur it is usually in a segment of the rectum not previously treated. It is always wise, before attempting to inject internal hemorrhoids, to preface the treatment with a thorough divulsion under nitrous oxide, thereby removing any abnormal irritability of the sphincters which may exist. Many of the accidents which have been reported are the result of neglecting this simple procedure.

The solution used for injection is a matter of great importance. The use of the stronger solutions will, in most instances, be followed by the formation of a slough, causing considerable pain and often resulting in quite serious ulceration, if unrecognized and untreated.

The solutions I usually employ are 50 per cent. aqueous solutions of Phenol Sodique or Phenol Bobœuf, filtered and freshly prepared. Dr. Tuttle recommends the following formula, which he attributes to Shuford:

R Ac. carbolic (Calvert's).....	3 ii
Ac. salicylici.....	3 ss
Sodii biborat.....	3 i
Glycerinæ (sterile).....	q. s. ad 3 i

An ordinary all-metal hypodermic syringe, with a three-inch extension barrel, may be used for the injection.

The conical speculum should be introduced and the hemor-

rhoid to be injected prolapsed into it. Firm pressure of the end of the speculum is then made against the lateral wall, thereby limiting the spread of the solution through the surrounding tissue. The hemorrhoid is then swabbed off with a 2 per cent. solution of creolin. From ~~three~~ to ten minims of the injection solution should be injected ~~directly~~ into the center of the pile, the amount depending upon the size of the tumor. The speculum should be withdrawn first, followed by the hypodermic syringe. Insert a 5-grain iodoform suppository. Only one tumor should be injected at a time, and an interval of from five to seven days should be allowed between treatments. Very little discomfort follows the injection, but if too much fluid is used a slough may be produced. This is usually limited, and should be treated by an application of stick nitrate of silver, followed by the regular use of iodoform or ichthyol suppositories. No further treatment should be instituted until the slough has healed. The fibrous or polypoid hemorrhoid would better be removed by excision, as the injection method usually fails to cure it and only results in sloughing, which later causes the patient considerable discomfort. The patient's bowels should be kept perfectly regular all through the treatment.

When a patient will submit to an operation under general anæsthesia the ligation or clamp and cautery method may be resorted to, as the results obtained are very much quicker, although I do not believe they are much superior to those obtained by injection, if the latter be skillfully performed under proper antiseptic conditions. The technique of the operative methods may be obtained from any of the standard text-books on rectal diseases.

The crushing method for the treatment of hemorrhoids is now rarely employed, as it possesses no advantages over the clamp and cautery or ligature operations. The *Whitehead operation of excision* of the pile-bearing area, while it has given brilliant results in the hands of a few surgeons, has so frequently been followed by stricture, when used by some less

skillful operator, that the sooner it is relegated to medical literature the better.

A Palliative for Bleeding.—Should the patient refuse to have any of the above methods of treatment used, great relief may be given in cases of bleeding by the use of the following suppository:

℞ Pulv. suprarenal. } aa.....grn. xxxvi
 Iodoform. }
 Ichthyol.....m xxiv
 Ol. theobrom.....q. s.
 M. ft. suppos. No. 12.
 Sig. One suppository half an hour before bowels are to be moved and one after movement.

The morning evacuation may be rendered more comfortable by the injection of from $\frac{1}{2}$ to 1 oz. of olive oil into the rectum just before retiring, retaining it overnight. In case there is strangulation, the piles should be replaced as soon as possible. Should there be much difficulty in this, the application of a compress wrung out of very hot water and pressed firmly against the inflamed mass of tumors will usually, in about ten minutes, reduce the congestion enough to allow them to be reduced.

FISSURE OF THE ANUS

This frequent and painful affection is often a complication of internal hemorrhoids, but may also exist with no other condition.

Symptoms.—The patient presents himself with a history of pain *beginning after stool* and lasting anywhere from a few minutes to several hours, often so severe as to incapacitate him from business. There may be more or less constipation occasioned by the excessive spasm of the sphincters. Bleeding is usually slight, except when complicated by some other condition, such as hemorrhoids or deep ulceration. Examination shows an anus tightly contracted, more from excessive spasm than hypertrophy. At the posterior margin of the anus there is often a small hypertrophied skin tab or sentinel pile, abo

which, upon separating the buttocks and having the patient bear down, the fissure will be seen as a small crack in the posterior aspect of the anus. Upon an examination with a speculum the fissure will prove to be an oval ulcer, sometimes having ragged indurated edges. At times in the upper angle of this ulcer a minute polypoid fold of mucous membrane may be found. Care should be exercised to be sure that there is no sinus in the base of the fissure leading into a submucous abscess.

Treatment.—Immediate relief of the symptoms will be obtained by a thorough divulsion of the sphincter. Subsequently, the removal of the sentinel pile and superior sentinel polypoid fold, under local anæsthesia, followed by a few applications of nitrate of silver, will suffice to make a perfect cure.

PRURITUS ANI

Probably no class of cases gives the physician or specialist so much anxiety and annoyance as do those in which the predominant symptom is an intolerable itching. Beginning as the consequence of rectal or anal lesions, such as external or internal hemorrhoids, or as the result of irritating discharges, the anal skin becomes so changed from irritation and scratching that it takes on a characteristic appearance and pathologic formation, being sometimes even eczematous in type, which persists after the primary cause has been removed.

Symptoms.—The anal skin in well-advanced cases is much thickened, friable, cracked, and lacking in vitality. It looks leathery and full of creases and has been classically described as a “washerwoman’s” skin. The itching is generally worse at night just after retiring, and the patient often wakes to find that he has been scratching vigorously at his anus.

Treatment.—In treating these cases careful attention to the diet must be given in those instances where there is an underlying condition of diabetes mellitus, Bright’s disease, or a rheumatic diathesis. The local cause should be removed and

applications should be made to the skin, not only to relieve the itching, but to try to bring the skin back to a normal condition. Applications of nitrate of silver or pure carbolic acid should be applied to the fissured skin, followed by a moderately stimulating but not irritating ointment. Adler recommends a dressing of citrine ointment, full strength or diluted as the case may require. Carbolated petrolatum or acetanilid ointment, 3 ss. to the ounce, may relieve the itching. Resin cerate will sometimes be found valuable. Where the skin is intolerant to ointments a wash of dilute alcohol, 10 per cent., or 5 per cent. Labarraque's solution, may be tried. A few cases have been relieved by the following:

℞ Menthol.....gr. xx
 Alcohol.....q. s.
 Ol. cadini }
 Ol. rusci } aa.....m. x.
 Ichthyol }
 Petrolat.....q. s. ad ℥ i
 M. ft. ung.
 Sig. Apply locally.

Internally ichthyol, given over a long period of time, has often brought about a decided improvement. Acetate of potash or sodium bicarbonate in large doses has proved of value. Even in the worst type of pruritus sticking faithfully at it, by both doctor and patient, will nearly always be rewarded by a cure or at least a very gratifying improvement.

ABSCESS

Varieties.—Abscess in the neighborhood of the anus and rectum is of such frequent occurrence, and early treatment so imperative, that the condition is one of the most important with which we have to deal. The most common varieties are the *marginal* or subcutaneous abscess of the edge of the anus; the *submucous*, found in the rectum and upper portion of the anus; the *perirectal*, situated above the sphincter in the cellular tissue surrounding the rectum; and the *ischioirectal*, occupying the *ischioirectal* fossa.

The infection may either start at the skin surface or may have its origin from pyogenic material within the rectum and carried to the point of inflammation by the lymphatics or blood current. Abscess within the rectum frequently follows infection from strangulated and sloughing hemorrhoids, neglected fissures, ulceration, strictures, both benign and malignant, and perforation by foreign bodies, such as fish bones or pieces of toothpick, that have been carelessly swallowed.

The marginal abscess usually follows the infection of external hemorrhoids, particularly the thrombotic variety. The ischiorectal abscess may be produced by traumatism followed by infection from the bowel through the lymphatics. The part which tuberculosis plays in these cases I feel sure has been overestimated, for by far the greater number of cases occur in persons previously healthy, and after cure they regain their previous good health.

The symptoms of marginal and ischiorectal abscesses are pain of throbbing character near the anus, localized swelling and redness of the skin, tenderness upon pressure, and induration over the affected area, followed by fluctuation and a discharge of pus if the abscess opens spontaneously. There may or may not be a general feeling of malaise, attended with a temperature of septic type. In the ischiorectal variety there may be a rapid loss of weight and strength, leading to a mistaken diagnosis of tubercular complications. The submucous and perirectal abscesses are attended with pain in the rectum or anus (worse during stool), tenesmus, constipation, and localized tenderness and induration upon digital examination. If the abscess has ruptured into the rectum there is a decided relief from pain, attended with the free discharge of pus at stool.

It may be accepted as an axiom that all fistulas in the neighborhood of the anus or rectum are the direct result of abscesses which have been either neglected or improperly treated. Were these abscesses radically treated, fistulas would rarely occur.

Diagnosis of Ischiorectal Abscesses.—These may be recognized by tenderness over the ischiorectal fossa, swelling, induration, and redness on either side of the anal margin. If pus be present, fluctuation may be obtained by bimanual palpation with one finger introduced into the rectum. The abscess may have ruptured spontaneously either upon the skin surface or into the bowel, in which last case the opening will usually be found in the interval between the two sphincters.

Treatment of Ischiorectal Abscess.—Every ischiorectal abscess should be incised immediately to prevent the formation of a fistula. Do not waste time in abortive treatment, incise freely and drain. The method I find most useful is to thoroughly anæsthetize the area for operation by a hypodermic injection of a 2 per cent. solution of cocain, and, with a curved bistoury, transfix the swelling in its long axis, carrying the incision well into the healthy tissue at either end. In the same manner make another incision in the middle of the first, and at right angles to it. With a pair of curved scissors trim off the projecting angles of tissue left by this crossed incision, thus converting the wound into a diamond-shaped cavity. If possible, curette out the necrotic tissue and pack the cavity tightly with iodoform gauze. Over this place a pad of cotton held in place by a T bandage. After forty-eight hours, remove packing and pack loosely with plain gauze or cotton saturated with acetanilid ointment 3 ss. to ʒi. Usually, it is not necessary nor desirable to put the patient to bed.

The Treatment of Complications.—When there is much *spasm of the sphincters* they should be divulsed as soon as convenient. Have the bowels moved regularly after the primary dressing has been removed. If excessive granulations develop, they should be cauterized with pure nitrate of silver. Probe the wound carefully at every dressing, and should any sinuses be found, divide them freely under local anæsthesia. Any overhanging edges of skin which persist should be scissored off. If the abscess has perforated the bowel, there should be no hesitancy in dividing the overlying tissues, especially if

the external sphincter only be involved. Divide the muscle fibers at right angles, so as to prevent a possible incontinence from a poorly formed cicatrix. Particular attention should be paid to the after-treatment, no case should be discharged until every part of the wound is absolutely healed. If done under general anæsthesia, the primary operation should include a careful dissection of all indurated tissue and the patient should be kept in bed until granulation has become well established.

In place of the cocain anæsthesia, Gant uses sterile water injected intradermically. As soon as the skin is thoroughly infiltrated over the line of incision, he makes subcutaneous injections until the tissues are fully distended. He claims that the advantages of this method are rapid anæsthesia and freedom from toxic symptoms.

FISTULA IN ANO

As mentioned above, the formation of a fistula must be secondary to an abscess. The classification into complete, incomplete, and "horseshoe" fistulas may be accepted for convenience' sake, and I believe the terms are so generally understood as to need no special description. The variety necessarily depends upon the direction in which the pus has burrowed and at what point the abscess has ruptured. If the abscess has only opened on the skin surface, the result will be an incomplete external fistula; if into the bowel, an incomplete internal fistula; if in both places, a complete fistula; and if the pus has burrowed around the outside of the rectum, the natural consequence would be the formation of the "horseshoe" fistula.

Diagnosis.—The presence of a fistula may be inferred from the history of an abscess followed by a continuous or an intermittent discharge of pus from the anus or skin surface. Upon examination a sentinel papilla or button of granulation tissue may be seen near the anus. Slight pressure will cause a drop of pus to be squeezed from the external opening of the

fistula, which is usually in the center of the papilla. A probe should be gently and carefully passed through this opening and the sinus explored to find if an internal opening exists. The internal opening in the majority of cases may be located in the interval between the external and internal sphincters. After the probe is in place, the finger may be inserted into the rectum, when, by careful palpation, the whole fistula may be outlined. If the finger is introduced before the probe is in place, the spasm of the sphincter will prevent the probe from passing into the internal opening.

The internal incomplete fistulas are usually first located by digital examination, the fistulous tract feeling like a fibrous cord beneath the finger. A bent probe may then be passed through a speculum and into the opening of the sinus.

When the fistula has multiple openings and branch sinuses, they should all be carefully outlined before operation. The injection of peroxide of hydrogen or of a colored solution into a fistula will often aid one to find the internal opening.

Treatment.—The recognized methods for the treatment of fistula are the application of cauterizing agents, the elastic ligature, incision, and excision, followed by suture of the primary wound. The use of caustics or absorbents has been so universally unsuccessful that it has justly fallen into disrepute. The operation by elastic ligature, aside from being very painful, is only applicable when the fistula has no branch sinuses, and even then the cures are few and far between. Excision of the fistulous tract, with suture of the wound, is only successful under the most perfect aseptic conditions, and because of the difficulty of obtaining these conditions in the neighborhood of the rectum, the wound often becomes reinfected and may take on conditions more serious than existed before the primary operation. One disastrous result will more than counterbalance the time saved over the more conservative method of free incision, with repair by granulation.

A Majority of Fistulas Non-tubercular.—Many authors insist that a very large percentage of fistulas is of tubercular

origin. While this may be true of cases treated in hospital dispensaries, it is certainly not true in respect to those treated in private practice. The majority of fistulas occur in persons otherwise healthy, while only about 12 per cent. are associated with or followed by tuberculosis of the lungs. It must be borne in mind that a tubercular fistula, and a fistula in a tubercular subject, are two entirely different conditions. The mere presence of phthisis pulmonalis should not deter one from operating upon a fistula, with fair chance of success, except in cases where this fistulous tissue shows localized tubercular infection. In all these cases it is of great advantage to employ local anæsthesia, thereby avoiding any possible irritation of the lung tissue by the anæsthetic.

In most cases where a fistula has existed for any length of time, there will be found an excessive irritability of the sphincters. Where this exists it is well to preface treatment by thorough divulsion of the sphincter. After two or three days' rest the skin and tissues over the fistula should be thoroughly anæsthetized with a 2 per cent. solution of cocain. A grooved director should be passed through the fistula, and the tissues above divided either with a bistoury or sharp scissors.

In place of a grooved director, the fistula knife shown in cut will be found very useful. It was designed by Dr. R. W. Martin, and is shaped like a large cataract knife with a flex-

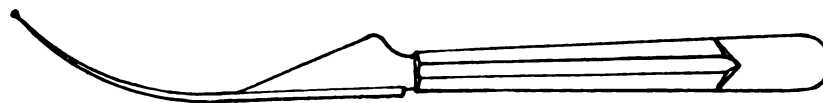


FIG. 102.—Martin's fistula knife.

ible, probe-pointed beak. The probe can be passed through the fistula, and then, with a finger introduced into the rectum, the end can be bent and brought out through the anus. The overlying tissues can then be divided with no danger of slipping.

If there are any other sinuses, these should be laid freely open. In dividing the sphincters, be careful to cut the fibers transversely. Stop any bleeding by torsion or compression

with hemostats, pack the wound tightly with iodoform gauze, and apply a pad of cotton held in place by a T bandage. It is not necessary in most cases to put the patient to bed, but he should keep quiet for the first twenty-four hours. At the end of forty-eight hours remove the gauze, clean out the wound, and dress with a light packing of plain gauze or cotton saturated with acetanilid ointment 3 i to 3i. Too tight a packing will prevent the formation of healthy granulation. Be sure to keep the granulations in check by the application of pure nitrate of silver every three to five days. Dress the wound daily, and carefully probe it to discover if any sinuses have been overlooked. If any are found, open them freely under local anæsthesia. Incomplete fistulas, either external or internal, may have to be made complete fistulas and freely divided before they will heal. The most important factor in curing a fistula is to obtain free drainage. Do not allow any overhanging edges of skin or undivided sinuses to persist, as they will only offer a field for reinfection. Do not persist in packing a wound with iodoform, as its constant use causes an overstimulation of the granulations, resulting in the formation of a poorly nourished hard cicatrix, often showing a pronounced tendency to contract.

PROLAPSE OF THE RECTUM

By prolapse of the rectum we mean any protrusion of the rectum, including either the mucous membrane or all of the coats of the bowel, through the anal aperture. Procidentia is a term used to describe a prolapse consisting of all the coats of the bowel. A slight eversion of the anal mucous membrane takes place at every stool, which may be considered physiologic.

Ætiology.—The causes of prolapsus may be summed up as any conditions which produce an abnormal tension on the rectal mucosa, such as straining at stool due to hemorrhoids, polypi, stricture, or tenesmus due to ulceration. It may be produced by any weakness in the natural pelvic supports of the rectum or sigmoid, particularly where there is an elonga-

tion of the mesentery. A relaxed condition of the sphincters may be another factor, especially that found in old age, in paralysis, and after operations which have destroyed the sphincteric control. In some very pronounced cases there will be found either an undeveloped internal sphincter or an entire absence of that organ.

Symptoms.—These cases usually have a history of gradually increasing constipation, followed by a protrusion from the anus, which at first goes back spontaneously. As the mass increases in size the patient finally has to reduce it after every stool. The mucosa, from irritation, becomes enormously hypertrophied, and after the condition has become pronounced, the constipation is followed by a teasing diarrhea containing much mucus, which is sometimes streaked with pus and blood. In examining these patients, unless the mass protrudes spontaneously, a full enema of warm water should be administered, so that the entire prolapse will protrude at stool. The prolapse will then be found to consist of a hemispheric tumor, varying in size from that of a walnut to that of a man's fist, depending upon whether the prolapse consists of mucous membrane, or includes all the coats of the bowel.

The opening of the bowel is usually situated about in the center of the tumor, and may appear simply as a slit, or it may be circular in outline. The mucous membrane is thrown into irregular folds which surround the prolapse. The mucosa is greatly hypertrophied, and is often covered with considerable mucus.

Treatment.—After examination the prolapse should be carefully reduced. The incomplete variety may be successfully treated by injections in the same manner as in treating internal hemorrhoids, care being taken to inject the solution well under the mucous membrane. A T bandage should be used during the first stages of treatment to keep the prolapsed part in place. If a polypoid tumor be present, this should be removed before any other treatment is tried. When the prolapse is due to hemorrhoids, a divulsion of the sphincters will often

stop the protrusion, leaving only the hemorrhoids to be treated.

In children, prolapse may frequently be cured by strapping the buttocks together with adhesive plaster. The child should be given an enema of warm water and made to have its bowel movement while lying on its side. Should any protrusion occur, it should be immediately replaced.

In adults, the wearing of plugs or compresses to support the anus gives only temporary relief, and eventually aggravates the condition.

In bad cases of complete prolapse, nothing but a radical surgical operation will give any permanent result. Among the best operations for this condition may be mentioned rectopexy, or suspension of the rectum on the sacrum; excision; and colopexy, which consists in anchoring the sigmoid to the parietal peritoneum and abdominal wall. Where the prolapse is not very extensive, the condition may be treated just as in a case of hemorrhoids operated on by the clamp and cautery method. Linear cauterization has been beneficial in some instances, but the results are rarely permanent.

For the technique of these operations you are referred to the larger text-books on rectal surgery. They should never be attempted by any but a skilled surgeon.

STRICTURE OF THE RECTUM

Varieties and Ætiology.—Stricture of the rectum may be either hereditary, spasmodic, inflammatory, or malignant. The first two varieties are so rarely seen that the inflammatory kind will be the only one considered. Under this heading may be included those produced by simple inflammatory processes, syphilis, and tubercular ulceration. While it is undoubtedly true that many patients suffering from stricture of the rectum are also afflicted with syphilis, yet it is rarely that the stricture can be directly proved to be caused by the specific infection; more often the beginning of the trouble can be traced to some acute

or chronic infection involving the deeper c
Inflammation of the mucous membrane also
be followed by stricture, as it is probably
the submucous and muscular coats involved
is set up. The primary inflammation is fo
exudate beneath the mucosa which finally
or transformed into fibrous tissue, and it is
traction of this fibrous tissue that produces
sociated with the stricture we nearly always
the mucous membrane, usually most pronou
and lower margins of the stricture, and acco
or less copious discharge of mucus and pu
a trace of blood. If the ulceration is exte
hemorrhages may be produced. As the re
submucous abscesses are often formed, resul
tion of one or more fistulas.

Symptoms.—A patient afflicted with stri
a history of a preceding rectal inflammation
pronounced symptoms, such as pain, diarrhe
mus; with the presence of pus or blood, t
acute symptoms have subsided, by a gradua
stipation, until finally the patient has to rely
tives or enemas to obtain any movement o
asionally, in place of constipation there ma
teasing diarrhea, with a general feeling, as
of “unfinished business.” Along with the
toms, there may be associated those of u
puration.

Diagnosis.—If the stricture is in the lov
rectum, the diagnosis can be made by di
while, if it is in the upper rectum or sigmoid,
bougie or proctoscope may be necessary to con
Care should be used in passing any instru
stricture, not to use any force, as the tissue is
and much damage may result.

Treatment.—The radical cure of strictur

often so disappointing and unsatisfactory that I believe we are justified in adopting a very conservative course, performing the more extensive operations only after all other expedients have failed.

Enemas, especially when used by the patient, frequently increase the irritation and ulceration. The persistent use of saline laxatives often increases the local tenderness. By far the most effective and soothing laxative is simple castor oil, and the sooner the patient contracts the habit of using it the better.

Many of the symptoms can be relieved by gradual dilatation of the stricture with bougies, especially if the treatment is continued for a long period of time, months or even years. The dilatation should be practiced once or twice a week, and after the ulceration has been controlled, and the stricture well dilated, the periods between treatments may be increased. The application of pure nitrate of silver to the ulcerated surfaces, followed by an irrigation with warm, normal salt solution is often beneficial. In some cases it is well to paint the whole surface of the stricture with Lugol's solution of iodine (Liq. iodi. comp.).

A very satisfactory sound for gradual dilatation of a stricture is the Kelly dilator for the female urethra an illustration



FIG. 103.—Kelly's dilator for female urethra.

of which is shown. Care should be exercised not to exert much force in passing any sound in the rectum, as it is very easy to perforate or tear the rectal wall. One of the safest instruments for dilatation is a soft rubber Wales bougie.

If, in spite of all treatment the stricture continues to contract, and the obstructive and ulcerative symptoms increase, radical surgical treatment should be advised. Rapid dilatation under anæsthesia often results disastrously from tearing, followed by

serious hemorrhage or secondary infection. Suture of the stricture, or internal proctotomy, is apt to be followed by infection due to insufficient drainage. Fairly good results may be obtained by performing a complete posterior proctotomy, dividing the stricture and carrying the incision through the internal and external sphincters and well beyond the coccyx on the skin surface. Incontinence is not a danger and the danger of infection is very slight. After the operations the dilatation must be kept up, as the tendency of the cicatrices to contract persists. Excision of the stricture is so often followed by a second and much worse stricture, that it is a question if the operation is really justified. Where the obstruction is so great as to endanger the patient's life, permanent colostomy should be performed.

In conjunction with the local treatment the general health should be kept up. In specific cases, tonics and antiseptics are indicated, but they appear to have little effect on the local condition. In tubercular cases, tonics and antiseptics are indicated.

Stricture or obstruction caused by malignant disease is discussed under that heading.

ULCERATIONS OF THE RECTUM

Ulcerations of the rectal mucosa are of frequent occurrence and conform in many instances to the types found in the intestinal tract above, especially to those found in the colon.

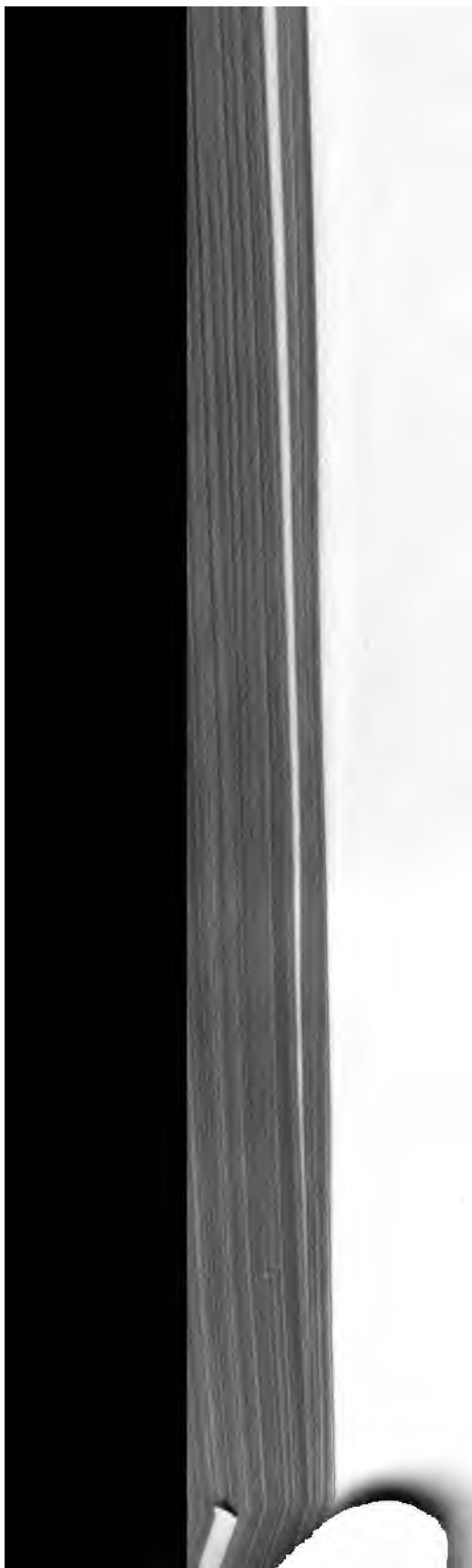
Varieties and Ætiology.—The most common type is due to acute catarrhal proctitis, tuberculosis, and syphilis. The ulcerations which are confined more particularly to the rectum are the venereal, the diphtheritic, and the stricture. In the hemorrhoidal area quite extensive ulceration may be produced by strangulation or thrombosis of internal hemorrhoids, or from the application of caustic solutions.

The symptoms of rectal ulceration are rather indefinite, usually assuming the form of vague uneasiness in the rectum, little or no pain, accompanied by a frequent desire to go to stool, especially during the day when the patient is on his feet. If the ulceration is situated near the anal margin, there is usually considerable pain, with marked spasm of the sphincter often associated with constipation, the constipation being probably secondary to the sphincterismus. The stools are often mixed with mucus, pus, and blood. With the aid of the proctoscope, the ulcers should be carefully examined, and either some of the discharge or a scraping from the *floor* of the ulcer should be obtained for bacteriologic examination.

The treatment, in conjunction with such internal medication as may be indicated by the systemic condition, should include a daily irrigation of the rectum with antiseptic or soothing solutions. A warm, normal salt solution will often be found beneficial, or we may employ a solution of boric acid, gr. 5 to 3i. Where there is much tenesmus, the injection of olive oil, with or without bismuth subnitrate, or an injection of starch water, will be found very soothing. The local application of nitrate of silver or iodine to the ulcers will often stimulate them and produce a cure. When there is much pain and sphincterismus a divulsion of the sphincters will relieve the distressing symptoms. The introduction of a suppository containing 3 minims of ichthyol, used three or four times a day, is a valuable procedure.

BENIGN TUMORS OF THE RECTUM

Benign tumors are frequently encountered in the rectum, and may conform to any of the histologic forms found in other portions of the anatomy, such as the mucous, lipomatous, or fibroid variety. The tumor most frequently seen is the polyp, or pedunculated growth, which may be made up of any of the above histologic elements. The mucous polyp is of most frequent occurrence, and may be found either in children or adults. These tumors are said to develop from an enlarged or



hypertrophied solitary follicle in the rectum, with irritation and traction, has caused an elongation of the membrane, thus forming a distinct pedicle. They originate at a point from one to four inches above the margin, although they may be found located in the flexure or above.

The symptoms of polyp of the rectum are usually a feeling of fullness or of a foreign body in the rectum, a frequent desire to go to stool, attended at times with the passage of mucus, and an occasional history of repeated hemorrhage. If the pedicle is very long, or the growth is situated high in the rectum, the tumor may protrude at stool. There is apt to be associated spasm of the sphincter, resulting in considerable pain.

The diagnosis is easily verified upon digital examination when a movable growth attached by a pedicle can be made out. By pressing the growth firmly against the rectal wall under the index finger, it may frequently be forced through the anus. If the growth is situated beyond the reach of the finger, it may usually be seen with the aid of a sigmoidoscope, especially after the rectum has been well irrigated.

The treatment of this variety is quite simple. If the pedicle is small, consists in seizing it with tweezers, and when the whole growth may be removed by pulling. If the pedicle is thick, it is safer to ligate first either by rubber band ligation, or else by transfixing the pedicle and ligating it in two places. If general anæsthesia is used, the polyp is seized with a hemorrhoidal clamp, the polyp cut off with a clamp, and the stump cauterized with a Paquelin iron. The rectum should be irrigated daily for about a week with an antiseptic solution, when the stump will usually be healed.

When multiple adenomas or large villous tumors are found in the rectum, because of their proneness to be followed by hemorrhage, the treatment is more complicated.

nant degeneration, nothing short of the most radical surgery should be thought of, and the case should be at once placed in the hands of a skilled surgeon for operation. For the differential diagnosis of these rarer and more serious forms of tumor, the reader must be referred to the larger text-books bearing on this subject.

It is a good plan, after the removal of any tumor from the rectum, benign or otherwise, to have the patient report for a rectal examination at regular intervals of from three to six months. Were this method a routine one, there is no doubt but that the percentage of inoperable cases of malignant disease would be much smaller.

MALIGNANT TUMORS

The great increase in the past few years of the mortality from malignant disease renders the diagnosis of this condition, when involving the rectum, one of great importance. Again, the uniformly fatal termination of these cases, except when a radical operation has been performed early, renders the necessity of making the diagnosis in an early stage of the disease imperative. These tumors may be divided into two great classes, carcinoma of the epithelial type, and sarcoma, or tumors in which the morphologic constituents conform to the connective-tissue type.

Varieties.—Of the first class of neoplasms, we recognize four varieties: Epitheliomatous, adenoid, medullary, and scirrhous cancers.

The most malignant variety is the medullary, while scirrhous may persist for a long period, months, or even years, before causing death. Epithelioma is most frequently found on the skin surface at the margin of the anus, while scirrhous is usually located in the sigmoid or upper rectum. The remaining two varieties are usually met with in the rectum proper.

The ætiology of carcinoma is yet in doubt. Age can hardly be claimed as a markedly predisposing factor, as we frequently come in contact with the disease in very early adult

life. Heredity may be a factor, but, aside for a lowered power of resistance of the (probably) special infection, its influence is small. It will likely be found that, as the rectum and sigmoid are often the seats of irritation, ulceration, inflammation than any other portions of the intestine, the rectum is more often involved in this disease process.

The symptoms of beginning carcinoma are vague and uncertain, often resembling those of hemorrhoids or of benign stricture. They are characterized by a sense of uneasiness in the rectum, pains in the rectum, flatulence, followed frequently by a mucous discharge of proportion to the apparent conditions, and sometimes at night. Early in the disease there may be no alteration in the general health. As the disease progresses, the symptoms increase, with gradual loss of weight and an increase of mucus complicated by the presence of blood and a gradual increase in pain. If the growth is near, or involving the anus, the pain increases. If the tumor is high up, as in scirrhus of the sigmoid, the obstructive symptoms will be more pronounced. The patient has lulled himself into a sense of security, taking it for granted that his trouble was all due to hemorrhoids. Much stress cannot be laid upon the fact that the patient complains of a diarrhea that cannot be checked. In a few days, a careful digital and proctoscopic examination of the rectum should be made.

The diagnosis of carcinoma in the lower sigmoid and rectum can usually be made by digital examination. The one thing that impresses the examining finger is a sense of resistance or infiltration. The finger comes in contact with a stone wall, and all fingers feel unyielding. This is probably due to the fact that the mucous membrane is not movable over the tumor. In the early stages of sarcoma. The growth is circumscribed and lobulated. In epithelioma of the anus there is a

able induration attended with ulceration, presenting a raised base and sharply outlined margins and a tendency to scab over. This scab breaks down repeatedly, each time leaving the ulcer larger than before.

When the carcinoma involves the upper rectum or sigmoid, the pneumatic proctoscope will render valuable assistance in making the diagnosis. The growth in most cases causes a stricture in the caliber of the gut, but the surface of the stricture will be found intensely inflamed or ulcerated, while in benign stricture of the rectum, the surface of the stricture will be found smooth and glistening, the ulcerations being, as a rule, situated above and below it.

Enlargement of the pelvic or inguinal lymphatic glands may or may not be present, while in some cases secondary involvement of the liver or abdominal viscera may be found.

The growth usually surrounds the whole rectum, yet at times it may only involve a small area. To verify the diagnosis, it is best, if possible, to remove a small portion of the growth for microscopic examination.

Treatment.—Once the diagnosis has been established, the question of treatment is a very serious one. The case should at once be examined by a competent surgeon to decide as to the advisability of a radical operation. While the ultimate cures from operation are discouragingly few, yet the condition, if left alone, is so absolutely fatal that it is a question whether it is not justifiable to tell the patient his exact condition and allow him to choose the few chances of surviving an operation (one to four) with a very remote hope of recovery, or to wait for the inevitable termination of the disease when only palliative measures are employed. Except in scirrhus the patient rarely lives over a year or a year and a half without operation, while, even if the growth returns after operation, he has been relieved of many of his symptoms and has had his life prolonged probably from six months to two years or more.

Where the growth is manifestly inoperable, or where the patient refuses operation, much good can be done by careful at-

tention to the patient's diet, feeding him or her on bland and unirritating foods. The bowels should be kept open either by castor oil or the use of non-irritating cathartics. The rectum should be freely irrigated daily with a 1-2 per cent. to 1 per cent. carbolic solution. If the growth is persistent, the growth may be curetted.

Since the x-ray has been used in treating cancer of the rectum we may hope to gain some benefit from its use. It must be confessed that, so far, the results have been unsatisfactory, and sufficient time has not elapsed to prove anything as to their permanency.

The treatment of malignant disease by electrolysis deserves mention. The method consists in the use of mercury-coated zinc electrodes inserted into the tumor. When the electric current is turned on, the mercury and zinc undergo electrolytic changes, forming soluble salts of these metals. By this electro-chemic action, the tumor and surrounding tissues become decolorized, the tumor itself softens and eventually comes away as a sterile, odorless mass. The surrounding tissues, acted upon by these salts, are destroyed, thus affording protection against metastasis or spread of infection. Massey has kindly furnished me with a description of the technique which is here quoted:

"The patient is anesthetized in the lithotomy position, lying upon a thick, moist pad, under which the positive pole of the indifferent pole. This pad should cover the entire body of the patient. The sacral region should be protected by a Kelly pad to prevent short-circuiting. Care should be exercised that no portion of the rectal plate comes in direct contact with the patient's body, as this will result. After etherization, small points of gauze heavily coated with mercury are inserted into the tumor, connected with the positive pole of the apparatus with a voltage of from 110 to 150 volts.

current is turned on until about 200 milliamperes for each point used is attained. (See illustration.)

"The amperage will vary with the size and position of the growth; in the lower rectum, where six or eight points have

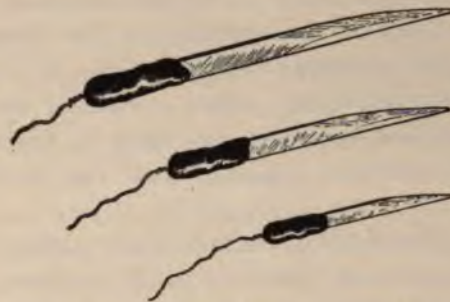


FIG. 104.—Short electrodes for external use.

been inserted at one time, 1600 milliamperes have been used. In the upper rectum, only one long insulated electrode can be employed, allowing the use of from 250 to 350 milliamperes. (See illustration.)

"When the current is connected at the point of one electrode, the temperature will have to be controlled by a stream of cold water used at intervals. About every half-hour the current



FIG. 105.—Long rectal electrode for internal use.

must be turned off, and a freshly amalgamated electrode inserted.

"During the hour and a half to two hours usually required to sterilize and destroy a large growth, repeated examinations with the finger and miniature lamp will show a progressive softening of the growth and its gradual change to a whitish-gray color. When all portions are softened the current is

turned off, the electrodes removed, and bed.

"The after-treatment is purely expectant over twenty-four hours, and any odor pre-
tiresly after the application, the slough rem-
some days. When the odor returns, and th-
to separate, mild antiseptic douches should
ployed. The granulating surface remaini-
clean, and mild antiseptic dressings applied.
est sign of recurrence appear, repeat th-
diately."

Sarcoma differs from carcinoma of the r-
volves the deeper coats, and the mucous me-
development, is movable over the tumor. A
dense in structure, it does not have the se-
touch noticed in carcinoma. Because the m-
intact, hemorrhage is absent until late in
growth is often pedunculated, and is more a-
cumscribed to one portion of the rectal wa-
velops rapidly, metastasis takes place early, :
tion may be expected in from six months to

The only possible treatment consists in
excision of the whole growth. The applic-
the incomplete removal of the growth result
the malignancy of the condition.

Within the past year the introduction of
in the treatment of malignant disease ad-
hope to the gloomy outlook of sufferers fro

LECTURE LXXX

BACTERIA AND ANIMAL PARASITES IN THE GASTRO-INTESTINAL TRACT

THE presence of bacteria in the gastro-intestinal tract is of double significance. Not only may many of them produce specific lesions and cause disease, but even the saprophytic bacteria may bring about changes in the food stuffs resulting in the elaboration of highly poisonous ptomaines which, when absorbed, give rise to the well-known conditions of auto-intoxication. Indeed, many of the symptoms accompanying gastro-intestinal derangements are due to the effect of these subtle poisons on the nervous system. When it is remembered that the gastro-intestinal mucosa is really an internal cutaneous surface, and, like the skin, forms a barrier to the entrance of micro-organisms, it is not surprising that bacteria may thrive in the normal gastro-intestinal tract without producing any serious harm; but let there arise an abnormal condition in the mucous membrane, let there occur a *locus minoris resistentiæ*, and bacteria hitherto harmless invade the injured mucosa and produce disease. In the case of dilatation, or atony, the stagnation of the food favors the multiplication of putrefactive bacteria and consequent formation of poisonous ptomaines.

The constant presence of bacteria in the normal intestines has led some authorities to the conclusion that many of them are concerned in the process of digestion. This view, however, is hardly tenable. Aside from the fact that repeated experiments on animals have demonstrated that digestion can be carried on in the absence of micro-organisms, the proposition that bacteria are necessary adjuncts in the process of digestion is contrary to our physiologic conceptions. One might as well

argue that artificial ferments are necessary digestion; yet we know that, under normal conditions, intestinal ferments digest just as much food for perfect nutrition, and excess of digestion does not harm the absorptive and eliminative organs, and does not retard assimilation. Besides, under normal conditions, the stomach and small intestines does not have time enough to act with sufficient force. With the undigested food the intestinal bacteria produce, such as the formation of indol, skatol, and other such changes are secondary and unessential, and are tolerated by the organism to a certain limited extent.

The bacteria which invade the gastro-intestinal tract as they do from the outside world, represent various groups, as cocci, bacilli, spirilla, sarcinæ, etc., and cannot be cultivated on any of our artificial media. Our knowledge concerning them is therefore in a very limited amount. Miller isolated about 30 species. *Ornithobacterium* innominata, *Bacillus buccalis maximus*, *Lactobacillus* maxima, *Iodococcus vaginatus*, *Spirillum* *Spirochaeta dentium* are normal inhabitants of the mouth and are non-pathogenic. Of the pathogenic microorganisms which occur in the healthy mouth without producing disease are streptococci, staphylococci, pneumococci, etc., and even diphtheria bacilli may be present in the mouth of perfectly healthy individuals. It is not until a pneumococcus was first isolated by Pasteur from a boy suffering from rabies, and by Sternberg from a child. The presence of pathogenic bacteria in the mouth of healthy individuals is explained by the fact that all individuals possess, for the time being, a natural immunity from the particular affections to which they are exposed to gain access.

Other micro-organisms pathogenic to animals are from time to time, isolated from the saliva of man, such as organisms distinctly pathogenic to man, such as organisms

divers affections of the gums and teeth. It is believed by some investigators that the saliva exerts an antiseptic action on pathogenic bacteria.

In the stomach only a few bacteria are found under normal conditions, this, no doubt, being due to the antiseptic action of the gastric juice, aided by the frequent emptying of that viscus. However, certain yeasts and yellow *sarcinæ* are found, and many bacteria, especially those producing acid fermentation, will thrive in the stomach, even in the presence of excessive amounts of HCl. Pathogenic bacteria are more susceptible to the action of HCl, but even they will escape uninjured, being protected by the bolus of food. Under abnormal conditions, such as deficiency of HCl or stenosis, with decreased motility and in dilatation, numerous bacteria may be found in the stomach. Many of them cause fermentation and putrefaction, and it is to these changes in the gastric contents that many of the symptoms accompanying these affections are due. The Oppler-Boas bacillus, an unusually long, non-motile micro-organism, is claimed by its discoverers to be constantly present in gastric cancer. Its presence, however, is not pathognomonic of that affection.

In the intestinal tract, *B. coli communis*, *B. lactis erogenes*, *B. putrificus coli*, and *Streptococcus coli gracilis* are permanent inhabitants. *B. erogenes capsulatus*, *B. butyricus*, and numerous other micro-organisms may be temporarily present. It is to be remembered, however, that the bile, to some extent, and in all probability the intestinal secretions, exert an antiseptic action on bacteria, and many micro-organisms found in the feces are dead. This, in part, accounts for the failure to cultivate some of the bacteria which are observed in the feces on direct microscopic examination. Of the pathogenic varieties, *B. typhosus* is invariably present in typhoid fever; *B. tuberculosis*, in intestinal tuberculosis; *B. anthracis*, in intestinal anthrax; *B. dysentericus*, in dysentery; *Spirillum cholerae asiaticæ*, in cholera; *Spirillum Finkler-Priori*, in cholera nostras, and *B. botulinus*, in meat poisoning. The importance

of carefully disinfecting the stools in all these affections becomes self-evident.

The bacteria of the gastro-intestinal tract are derived from the air and food. Those from the air are lodged in the mouth and find their way into the stomach and intestines with the saliva and the food. While in this way pathogenic bacteria may gain entrance and set up specific lesions in the stomach or intestines, the much more serious danger lies in the ingestion of pathogenic bacteria contained in food. It is a matter of common experience that typhoid and tubercle bacilli may be transmitted through milk, and the latter micro-organism may be also contained in the meat from tuberculous animals. Milk, on account of its being a most suitable culture medium, is especially prone to contain fermentative as well as pathogenic bacteria. Investigations carried on in New York, Philadelphia, and other cities disclosed a most deplorable condition of the milk supply of large cities. Aside from pathogenic bacteria, which such milk may and in many cases does contain, the micro-organisms commonly found in polluted milk are capable of producing synthetic changes in the milk, rendering it highly poisonous. The pity of it is that pasteurization does not destroy spores, and boiling changes the character of the milk to such an extent as to render it somewhat less digestible.

Meat may contain putrefactive bacteria, tubercle bacilli, or the ova of animal parasites.

Uncooked fruit and vegetables may be the carriers of pathogenic and putrefactive bacteria, and it is frequently in this way that disease is contracted.

Fish, especially shell fish, may carry the typhoid bacillus or putrefactive bacteria derived from sewage-polluted beds.

Water, when polluted with sewage, may contain the typhoid bacillus, the cholera spirillum (in times of an epidemic of cholera), the bacillus of dysentery, and other micro-organisms still unidentified, which produce digestive disturbances and diarrheal diseases.

It is thus seen that the harmful bacteria found in the gastro-

intestinal tract are derived from food and drink, and it behooves us to guard most zealously against contamination of the food taken by the well, and more especially by the sick and feeble.

As a corollary to the subject under consideration, the question of intestinal antiseptics may be taken up. The antiseptics provided by nature are the HCl of the gastric juice, the bile, and probably other secretions, the existence of which we can only suppose *a priori*. However, as already mentioned, even these natural antiseptics have their limitations, for the hardier micro-organisms are not affected by them. In the case of the gastric juice, it is only the free and not the combined HCl which exerts any antiseptic action at all. Moreover, natural antiseptics are biologic in nature, and, like the anti-bodies, act in minute quantities. How different is the case with artificial chemical antiseptics. In the first place, they are all unstable organic compounds, and they may undergo such changes in the gastro-intestinal tract as to have completely altered their properties. In the second place, they are diluted by the food and gastro-intestinal secretions to such an extent as to render them practically inert, and if employed in sufficient concentration, act injuriously, not only on the bacteria, but also on the secreting cells. It therefore appears irrational to depend much on intestinal antiseptics, the ever-increasing number of which in itself proves their comparative worthlessness. It would seem far more rational to prevent the entrance of harmful bacteria into the gastro-intestinal tract, than to permit them to enter into the deep recesses of our internal anatomy, and then hunt them down with yard-long synthetic formulæ.

The animal parasites which are found in the gastro-intestinal tract, and which may be productive of diseases of these organs, are protozoa and vermes. Of the former, the *Amœba coli*, a unicellular animal organism, is concerned in the production of tropical dysentery and hepatic abscesses. However, later investigations by Shiga (of Japan), Kruse (of Germany), Flexner and his pupils, Vedder and Duval, in this country, have

shown that certain cases of sporadic and epidemic dysentery are caused by a specific bacillus, first isolated and described by Shiga. *Amœbæ coli*, therefore, are no longer held as the sole cause of dysentery. Another protozoan belonging to the Ciliata, *Balantidium coli*, causes severe diarrhea. This parasite is especially common in Russia.

The vermes, Cestoda and Nematoda, are commonly found in the intestinal tract. They cause pathologic changes, either mechanically, by occluding cavities, producing obstruction, or chemically, by generating irritating poisons. In the case of the tapeworm, the large size of the parasite, which obtains its food by absorption, may interfere with nutrition; the tapeworm, *Bothriocephalus latus*, producing in addition a systemic poison. The round worms are extremely irritating, and diarrhea, vomiting, and other gastro-intestinal disturbances are the result of their irritating action. The seat-worm, on account of its very irritating properties and migratory habits, is liable to lead to masturbation, either by direct irritation of the genitals, or by indirect reflex irritation of the anus. Recently, Metchnikoff advanced the theory that the Nematoda, or round worms, are frequently the cause of appendicitis, which they are said to produce by irritating the appendix and favoring bacterial infection. This theory seems to be supported by his own observations, as well as the experience of some other observers, although the subject has been investigated by a number of men who failed to substantiate it. The vermes, which may be found in the intestinal tract, are *Ascaris lumbricoides*, *Oxyuris vermicularis*, *Trichocephalus dispar*, *Ankylostoma duodenale*, *Tenia solium*, *Tenia saginata*, and *Bothriocephalus latus*. They are considered more in detail in the following section.

THE INTESTINAL PARASITES

These are described with sufficient fullness in most of the text-books on Practice, but a brief account of them will be in place here. The diagnosis of worms should rest on one thing

only, and that is the finding of either the worms or their eggs in the feces. Intestinal parasites act primarily as irritants, and the symptoms of reflex irritation do not, as a rule, differ from those produced by any other irritant. Moreover, the symptoms are extremely variable, and lack altogether in uniformity or constancy, except in the case of *ankylostoma duodenale*. Between pruritus ani, or the irritation due to pinworms, and severe digestive disturbances caused by tapeworms, there is a variety of conditions produced by the various parasites, conditions in no way differing from those due to other factors. To make a diagnosis of worms without a careful examination of the feces, is to do the patient harm by mistaking the true ætiologic factor involved.

In cases of persistent symptoms referable either to the nervous or digestive system, especially in children, you should think of worms and look for them. In all such suspicious cases, instruct the patient to evacuate his or her bowels in a vessel partly filled with tepid water, and then carefully examine each evacuation for bits of tissue, or anything which looks like worms. As a rule, any layman will detect readily a roundworm or a tapeworm, nor does the detection of oxyuris or pinworms present much difficulty. The suspected worm, if found, should be fished out and placed in a bottle containing alcohol or formalin for further examination.

The Principal Varieties of Tapeworms, etc.—

The identification of the adult parasite presents little difficulty. Of the more common ones, the tapeworm, the round worm, and the threadworm, are of interest in this country. Of the tapeworm (cestodes) the *Tenia solium* and *Tenia mediocanellata* or *saginata* are the most prevalent varieties, while the *Tenia echinococcus* is comparatively rare, and the *bothriocephalus latus* is only found in European immigrants, especially those coming from Switzerland, Germany, and the Baltic countries.

The *T. solium* develops in the lower part of the small intestines, the infection being derived from insufficiently cooked measly pork, where the parasite exists in the form of encysted

larvæ called cysticerci. The adult worm is dis proglottides or segments being 8 to 10 mm. mm. broad, and the branchings of the uterus seven to ten in number and divide peripherally T. S.)

The *T. saginata* is distinguished by being preceding. The segments measure 18 mm. by number being about 1200 to 1600. The uteri 20 to 30 branches, which divide dichotomously (Sg.). The segments are frequently evacuated apart from defecation.

The *bothrioccephalus latus* is the largest tapeworm. It results from eating infected fish, as a rule. There are from 2400 to 3500 segments, each measuring 12 mm. in length and 12 mm. in breadth. The uterus is in the middle of the segment. (Fig. 106, B. L.) To distinguish the uterus, the segments may be placed between two slides and held up to the light, or they may be placed in oil of cloves until translucent, and mounted in balsam.

It is often important to know whether the head has been removed. The heads of the tapeworms are distinguished by the following characters:

T. Solium.—The head is about 1 mm. in diameter, furnished with a rostellum and 26 hooklets, besides sucking discs. (Fig. 106, H. T. S.)

T. Saginata.—The head is 1.5 to 2.5 mm. in diameter, neither rostellum nor hooks, and possesses suckers which are surrounded by a line of spination of the neck quite evident. (See Fig. 106, H. B. L.)

Bothrioccephalus latus.—The head is very small, looking like an enlargement of the thin neck. It has two deep furrows or suckers arranged long and short. (Fig. 106, H. B. L.)

Of the *nematodes*, the *ascaris lumbricoides* and *micularis* (threadworm) are the most common.

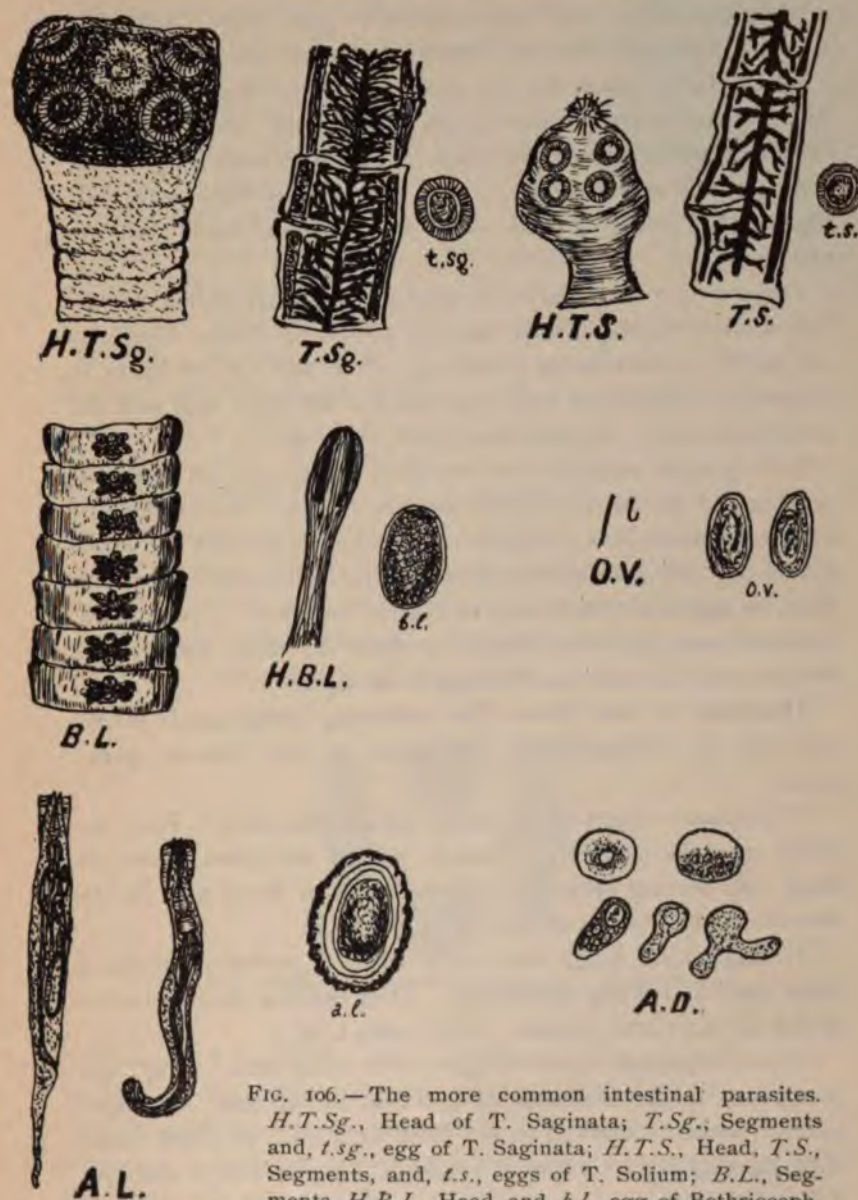


FIG. 106.—The more common intestinal parasites.

H.T.Sg., Head of *T. Saginata*; *T.Sg.*, Segments and, *t.sg.*, egg of *T. Saginata*; *H.T.S.*, Head, *T.S.*, Segments, and, *t.s.*, eggs of *T. Solium*; *B.L.*, Segments, *H.B.L.*, Head, and, *b.l.*, egg of *Bothriocephalus latus*; *O.V.* and *o.v.*, *Oxyuris vermicularis* (male and female) and eggs; *A.L.* and *a.l.*, *Ascaris lumbricoides* (male and female) and egg; *A.D.*, Various forms of *Amœba dysenteriae*.

Ascaris lumbricoides is represented by both sexes. The male is about 250 mm. and the female about 400 mm. The cylindric body tapers toward each end, presenting longitudinal and many cross stripes. It is pale pink, the head being slightly different in color. The intestine runs through the entire worm. The female possesses a twisted double uterus which may contain many eggs.

Oxyuris vermicularis is a small, white, thread-like worm. The male is about 3-4 mm. and the female 8-12 mm. The tail of the former being rolled up, while that of the latter is tapering. The mouth end is provided with three pairs of suckers. The intestinal canal is straight and in the mid-line.

It frequently happens that the adult worms are found in a particular specimen of feces, and the urgency of the case demands an immediate examination, or it may be that the forms are not sufficiently numerous to be examined. In such circumstances, an effort should be made to detect the feces by a careful microscopic examination.

Diagnosis of the Ova.—The following differences will aid in distinguishing the eggs of the various sites:

T. Solium.—Eggs ovoid, about 35 microns in diameter. They develop into the cysticerci cellulosi, which are found in man. By tearing open the cyst the scolex or larva is served on the inner wall. (Fig. 106, t. s.)

T. Saginata.—Eggs more oval than *T. solium*. They have a thick shell and lining membrane. They develop into the cysticerci cellulosi, which do not occur in man. (Fig. 106, t. sg.)

Bothriocephalus latus.—Eggs oval, 0.07 mm. by 0.045 mm. thick. Surrounded by a thin brown membrane of which is marked in the form of a lid. They develop into a ciliated, freely moving sporozoite (Fig. 106, b. l.)

Oxyuris vermicularis.—Eggs oval, 0.05 mm.

ing an embryo with a sharp posterior end. The shell is flattened on one side, and surrounded by an albuminous substance. (Fig. 106, o. v.)

Ascaris lumbricoides.—Eggs oval, about twice as large as the preceding; possess a thick double shell, surrounded by a layer of an albuminous substance. (Fig. 106, a. l.)

The treatment required for the expulsion of the various kinds of intestinal parasites will be described at the end of the entire section devoted to such parasites.

Amœba Dysenteriæ.—While it is generally admitted that dysentery occurring in this country is usually due to a bacillus isolated and described by Shiga, yet there are undoubtedly some cases of that affection caused by an amœba. This protozoön may be found in large numbers in the lesions as well as the feces. The latter are best examined when fresh, or at least not over twenty-four hours old.

The Amœba dysenteriæ, or more commonly called Amœba coli, is a round, oval, or irregular protoplasmic body, varying in size from 10 to 50 microns. It is pale or faint green in color, refractile, with sharply outlined borders, and contains a large



FIG. 107.—Amœba coli mitis or vulgaris. (After Roos.)

vacuole, and in some cases a nucleus. The greater central portion of the parasite contains the vacuoles, and is known as the endoplasm; this is surrounded by a narrow, clear layer, known as ectoplasm. The parasite is, as a rule, actively motile, throwing out pseudopodia. It frequently contains within its endoplasm foreign substances, such as various granules and

fresh or disintegrated red blood cells. The smear may be stained with alkaline methylene blue for about five minutes and then washed in distilled water.

It should be remembered, however, that *Amœba dysenteriae* is distinguished with difficulty from *Amœba coli vulgaris*, which is a harmless inhabitant of the human intestines. It is, therefore, well in all cases to corroborate the diagnosis by feeding young cats on the feces containing the amœbæ. If the amœbæ are of the pathogenic variety, dysentery will result in the experimental animals.

Amœbic dysentery, the disease produced by this organism, is described in Lecture LXXII.

Ankylostoma Duodenale, or Uncinaria Duod.—This parasite has been comparatively unknown in the United States until very recently, and it is still of rare occurrence, or at least rarely observed here. It has been long familiar to physicians on the continent of Europe, and has passed in some quarters under the name of Egyptian chlorosis. It is endemic in Egypt and the southern parts of Europe, and prevails chiefly among the men employed in brick yards or tile works, but also, to some extent, among farmers who work much in moist earth.

The parasite has, in recent years, been seen in this country among Italians and other immigrants from the South of Europe, but a form of it, which is a little smaller, and differs in other respects to some degree from the foreign type, is now encountered not infrequently among the negroes and other laborers in our Southern States, and has been named by Stiles (1902) *Uncinaria americana*, according to Henry B. Ward, who contributes the article on Nematoda to the new edition of Wood's "Reference Handbook," vol. vi., page 205.

Drs. Herman B. Allyn and M. Behrend contributed to *American Medicine* of July 13, 1901, a paper on Ankylostomiasis in the United States, with report of a case treated by them in the Philadelphia Hospital. Their paper contains an excellent illustration of both the male and female parasite, which, by their courtesy and that of the editor of *American Medicine*,

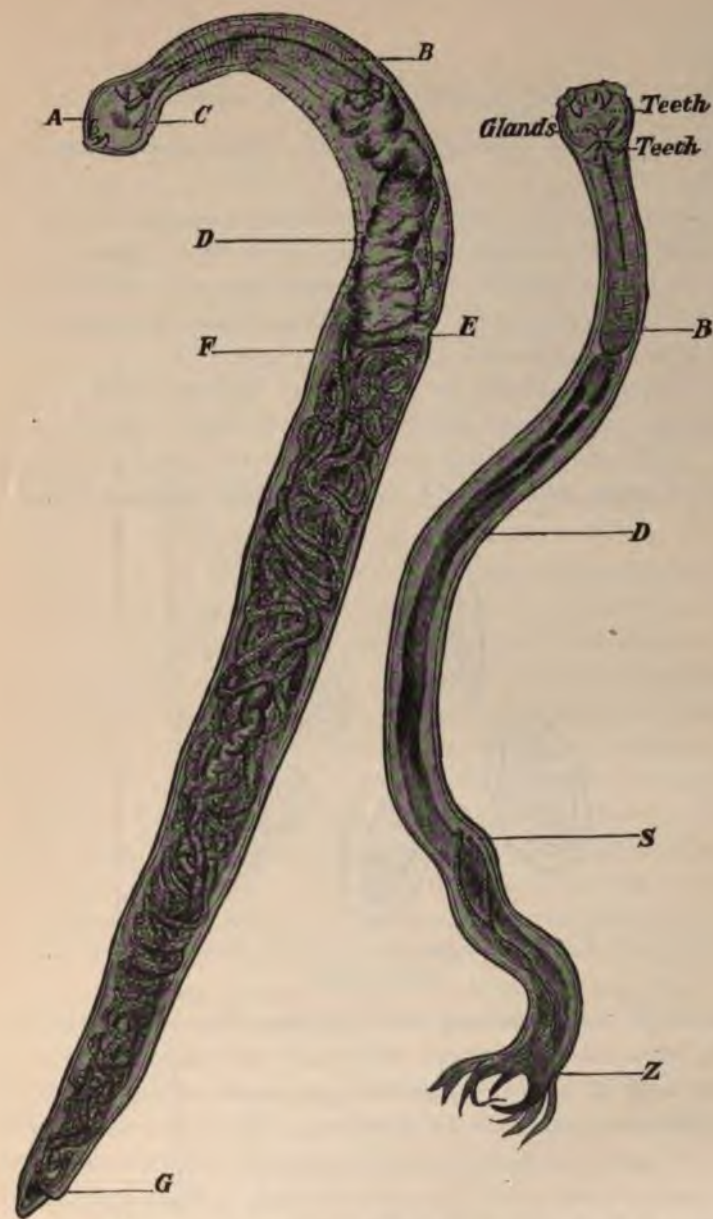


FIG. 108.—*Ankylostoma duodenale*. The larger one at the left is the female; *A*, Head, showing teeth and glands; *B*, Esophagus; *C*, Mouth glands; *D*, Intestines; *E*, Genital opening; *F*, Uterus and oviducts; *G*, Anal orifice.

The figure on the right is the male. The teeth and glands show more distinctly. *S*, Spermatic ducts containing cells; *Z*, The bursa copulatrix. (From a paper by Herman B. Allyn and M. Behrend in *Am. Med.* of July 13, 1901. By permission.)

I am permitted to reproduce here. (See illustration, Fig. 108.)

I have had made, also, an accurate representation of the ova of *Uncinaria americana*, which it is even more important that you should be able to recognize, since they may be discovered under the microscope, even when the parasites themselves cannot be found. (See illustration, Fig. 109.)

Ward thus describes the well-known *Uncinaria duod.*, or as formerly called most frequently, *Ankylostoma duod.*:

"Body cylindric; buccal cavity, with two pairs of unciniate ventral teeth, and one pair of dorsal teeth, directed forward;

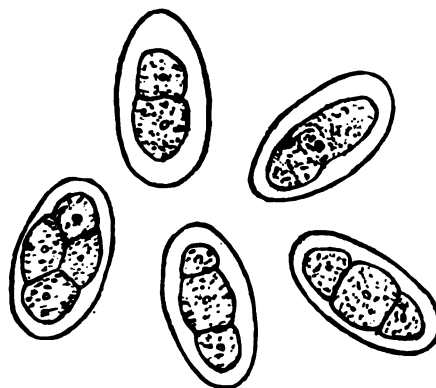


FIG. 109.—Eggs of *Uncinaria americana* from feces. \times . 330.
(After Stiles.)

dorsal rib not projecting into capsule. Female, 10-18 mm. long, by 0.5-0.6 mm. wide; vulva at or near posterior third of body; eggs 52 by 32 μ . segmenting when deposited with direct development. Male, 8-11 mm. long, by 0.4-0.5 mm. wide; caudal bursa, with dorso-medial lobe, dividing at two-thirds the distance from base, each branch being tridigitate, and with prominent lateral lobes united by a ventral lobe; spicules long, slender."

This form of parasite is found in many parts of Europe, Asia, and Africa, as well as in the West Indies, and occasionally in the United States.

The *Uncinaria americana*, described by Stiles and quoted by Ward, presents the following characteristics:

Ventral recurved uncinata teeth absent from mouth, one pair prominent dorsal semilunar plates, and an inconspicuous ventral pair being present; dorsal median conical tooth, projecting prominently into buccal capsule. Female, 9-11 mm. long, by 0.31-0.35 mm. wide; vulva near middle of body, but in front of it; eggs (Fig. 109) 64-72 μ , by 36-40 μ , segmenting, or with well-developed embryos when deposited. Male, 7-9 mm. long by 0.29-0.31 mm. wide; dorsal ray of caudal bursa divided to the base, each branch bipartite to tip. Species otherwise similar to *U. duodenalis*.

Symptoms of Ankylostoma, etc.—The chief symptoms are anæmia and debility, which are often very marked and are caused by the blood-sucking habit of the parasite; also certain gastro-intestinal disturbances. The red-blood cells have sometimes fallen below 1,000,000. These include especially nausea with often vomiting, flatulence, constipation, or diarrhea, severe gastric or colicky pain, and marked changes in appetite. There are likely to be also dyspnœa, vertigo, dropsy of the lower limbs, cold hands and feet, and occasionally hemorrhages. Afternoon fever may sometimes be observed, and extreme drowsiness may develop. There is occasionally leucocytosis.

Pathologically the disease causes the changes to be expected from a long and severe anæmia, with much congestion and evidences of hemorrhage in the intestinal mucosa. The heart is often enlarged.

The *diagnosis* turns upon the observance of the above-described symptoms in connection with the presence of either the parasite or its characteristic ova in the evacuations.

The *prognosis* of ankylostoma duod. is good if appropriate treatment is begun early, and in persons not infested with too great a number of the parasites. Otherwise, it runs a prolonged and serious course and often terminates fatally.

Treatment of Ankylostoma duod.—Any of the remedies for tapeworm may be hopefully employed, but the greatest success

has been achieved with thymol, and with the male fern. Ally and Behrend report favorably of thymol given in doses of 1 to 30 grns. in water at 8 A. M. (fasting) and repeated : 10 A. M., followed in two hours by castor oil.

Treatment of Tenia, Round and Seat Worms.—In the *treatment of tapeworm*, regardless of the variety, the most successful method has been found to be the following:

First, to empty the alimentary canal by purgatives, the limit the diet strictly to a few very simple articles for one day. The Germans insist that it is well to select for this special preliminary diet articles of food which are believed to act injuriously upon the worm. These include onions and garlic with salt herring, all chopped finely and mixed into a form of salad. Strümpell attributes to strawberries, cranberries, and bilberries a similar disturbing action upon the parasite. After the preliminary evacuations of the bowels and such a diet as above mentioned for one day, some writers advise evacuating the bowels again at bedtime, and then the next morning to take no food whatever, unless it be a cup of black coffee, which, however, may be sweetened,—though the maximum doses of male fern are safer after a meal. Then, it is in order to administer the special teniafuge or teniacide. There are a number of such remedies which have been employed with success. These include the ethereal extract or oleoresin of male fern, which may give in doses of f 3 ss. to f 3 ii, though the Germans carry the dosage as high as f 3 iiss., especially for *tenia solium* and *tenia koosso*, in the form usually of an infusion, one-half ounce of the dried flowers in a pint of water; tannate of pelletierine in doses of 5 to 10 grains, usually effective, but very expensive; infusion of pomegranate, 2 to 3 ounces of the bark in a pint of water; and last, but by no means least, a mixture of pumpkin seed chopped up finely with sugar. Of the last-mentioned mixture as much as a teacupful may be given to adults, and in proportion to children. It is a safe and not very unpleasant remedy to take, and often efficient. Another remedy recently recommended, concerning which I have had no experience, is the o

of pine needles, given in half-dram doses, either in a capsule or in emulsion. These remedies usually either kill or benumb the worm so that a brisk cathartic, given two to three hours later, effects its expulsion. In some instances, only a part of the parasite is thus expelled, and, if the head should be retained, it soon reproduces itself. Hence the importance of the directions already given in this lecture for passing the stools after such a treatment into tepid water so that it may be readily determined whether the entire worm, including the head, has been removed. Tapeworm remedies need to be fresh and fully active in order to succeed.

Probably the most successful of all the different remedies is the male fern—*felix mas*—and a very efficient and convenient way of administering it is in capsules, on account of its unpleasant taste. It is especially effective when given in milk, which tapeworms prefer as a food. The drug is not entirely safe, and cases of poisoning from it are on record, one of them fatal; but it is believed that the lethal result was in consequence of the fact that castor oil was administered with it, thus greatly increasing its absorption into the system. No cathartic should be administered with it, but two hours after it some other one than castor oil.

Whenever, in any case, the examination shows that the head of the parasite has not been passed, there will be reason to expect a recurrence of all the symptoms in a short time; but it is better to wait until evidences appear that the worm has reproduced itself before repeating the administration of remedies to expel it. To repeat the violent course of remedies required to expel a tapeworm within a few days is never desirable, and it is particularly unsafe to repeat so soon a full dose of male fern.

In the treatment of round worms *santonin* is the only drug that need be considered. Half-grain doses of it are prepared in troches, which are now official in the United States Pharmacopeia. For a child under two years, one of these, or the same dose as a powder with sugar, may be given at night, and

again the next morning, upon an empty stomach, followed an hour later by a dose of castor oil, rhubarb, or calomel. A child five years old will need doses of one grain, and adults from 3 to 4 grains, administered in the same way.

The effect of all anthelmintics is much enhanced by restraining the patient to the simplest, and preferably liquid, food for a few days, before the remedy is begun, and you should see to it that during the same time the bowels are especially open—that there are at least two soft or liquid stools daily.

The treatment of seat- or thread-worms requires the frequent irrigation of the colon with some mild disinfectant solution—it matters little what one, so that it be mild enough not to irritate the mucosa. An infusion of quassia or simple olive oil injected every few days for several weeks has often succeeded in my own experience. In female children especially it is well to have a few grains of zinc ointment, or unguentum hydrargyri cinerei, smeared about the anus once a day, to prevent the migration of the worms into the vagina. Weak solutions of quinine, or boracic acid, etc., have also proved effective.

In stubborn cases the administration of santonin has been recommended as directed for round worms. Whitaker,¹ however, doubts the efficiency of any remedies administered by the mouth, but insists that enemas of soapy water, after a preliminary irrigation to empty the colon completely, are as efficient as any other. He advises one such enema every week for three weeks.

Since the worms inhabit the upper colon and cecum, as well as the rectum, it is important that the enemas should be caused to pass entirely through the colon, and this is best effected by having the patient either in the knee-chest position during the injection, or lying on the left side for a short time at first, and afterward on the right side.

¹ Wood's "Reference Handbook," vol. vii. p. 794, New York, 1889.

TRICHINA SPIRALIS AND TRICHOCEPHALUS DISPAR

Trichina occurs frequently in pork—very rarely in the meat of other animals. It exists in two forms or stages of its development: (1) in a sexually mature form, when its habitat is the intestine, and (2) in a larval or immature form, when it is found in the muscles, usually encapsulated. When portions of meat containing the encapsulated larvæ of trichinæ are eaten, the latter are liberated within a few hours after reaching the stomach, by the opening of the capsules, and develop with great rapidity. By the end of forty to forty-eight hours the immature larvæ have fully matured in the intestine, and impregnation of the females takes place. The birth of a new progeny occurs by the end of a week from impregnation, and in two weeks more the embryos have migrated from the intestine to the muscles of the infected person.

The fully developed female trichinæ are 3 to 4 mm. long, while the males are only half so long. At this stage the parasite can be seen by the unaided eye.

Illustrations of trichinæ are shown on page 942.

Trichinosis is the name given to the acute febrile disease produced by these parasites. It is rather a disease of the muscles than of the gastro-intestinal tract, and therefore shall be only briefly considered here. However, a few days after eating meat infected with trichinæ, the victim is likely to complain of certain indigestion symptoms—loss of appetite, nausea, vomiting, and diarrhea, with usually pain of a colicky kind, besides much flatulency. By the end of a few days, or a week after the larvæ have reached the muscles, there is developed fever with pains, and usually decided stiffness in the muscles as the predominant symptoms. There is likely to be also bronchitis, and sometimes pneumonia. Involvement of the respiratory muscles causes a marked form of dyspnœa. When the infection is severe, and the fever high in consequence, there is often delirium. Sometimes œdema of the face and eyelids is an early symptom.

The *diagnosis* must be made from typhoid fever, muscular rheumatism, etc., and may be established with an approximation to positiveness in marked cases by the œdema and the muscular symptoms—pain and stiffness—especially when dyspnœa

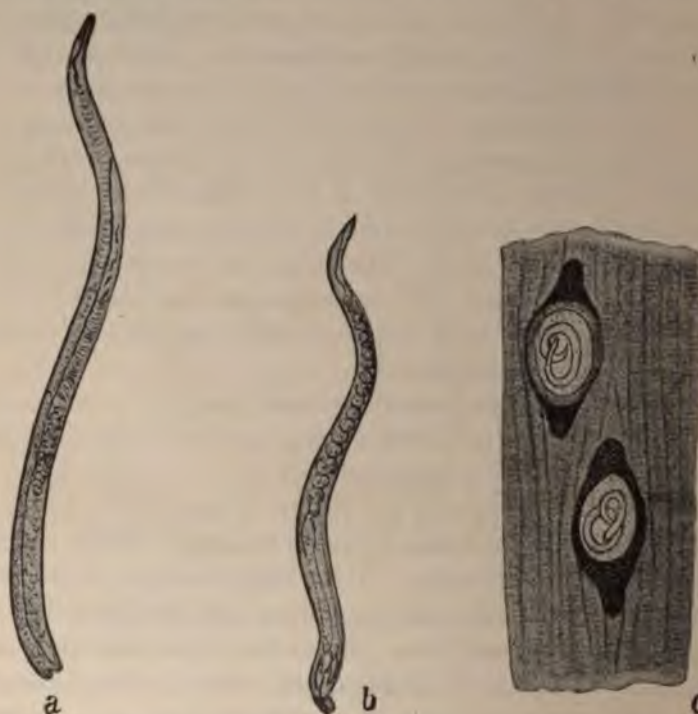


FIG. 110.—*Trichina spiralis* (after Leuckardt); *a*, female; *b*, male of intestinal trichina; *c*, muscle-trichinæ in capsule.

results from involvement of the respiratory muscles; but the recognition of the parasite in a piece of excised muscle affords the only certain evidence of the disease, except when the adult trichinæ can be found in the stools.

The mortality from the disease differs widely in different epidemics—from 0 to 30 per cent.

Treatment.—Meat, especially pork, should never be eaten raw, or insufficiently cooked, if trichinæ and teniæ, as well as

other parasites which infest the flesh of animals, are to be avoided.

For the curative treatment of an attack of trichinosis at an early stage, while there is still a probability that a part of the parasites remain in the intestines, the most effective method is prompt and energetic cleansing of the alimentary canal by purgatives and colon douches, followed by full doses of intestinal antiseptics. Santonin, also, has often proved effective.

When the migration is over, and the muscles have been fully infected, there is little to be done, except to sustain the strength and vital powers in every way possible. Meanwhile you will,



FIG. III.—*Trichocephalus dispar*. (From "Krankheiten des Darms u. des Bauchfells," von Prof. Dr. C. A. Ewald.)

of course, alleviate the pain and insomnia by anodynes and emollient local applications. The open-air treatment, now universally recommended and largely employed for tuberculosis, will add much to the patient's chances in the combat with such an inaccessible enemy, and moderate tonic doses of quinine, iron, etc., are beneficial.

Trichocephalus Dispar.—This parasite frequently occurs in the cecum or adjacent parts of the intestine, but produces usually few or no symptoms. Ewald speaks of it as harmless, though other authors mention that diarrhea, or reflex nervous symptoms, may sometimes result from its presence in man. Infection is caused by taking the eggs in uncooked food or in

water. Raw fruit, lettuce, and other green vegetables are especially liable to convey them into the alimentary canal unless carefully washed.

The parasite is 4 to 5 cm. long. It is shown in the illustration on page 943, the two smaller figures, to the right of the large one, representing the worm, life-size.

The ova, which are not killed by either cold or drying, are of a peculiar oval, with a knobbed projection at either end.

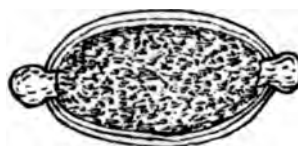


FIG. 112.—Ovum of *Trichocephalus dispar*.

They are about 50 μ long, of a brown color, and have a hard shell. They develop in wet earth or water, but very slowly—in several months. An illustration of one of them is here given.

The *trichocephalus dispar*, or more frequently its eggs, may be recognized in the stools by a careful microscopic examination. It is seldom, however, that the worms themselves can be found in the stools.

As to *treatment*, various anthelmintics and teniafuges have been used successfully. Male fern and thymol internally are especially recommended. Douches of the colon with antiseptic solutions are useful adjuvants.

LECTURE LXXXI

GASTRO-INTESTINAL CONDITIONS IN RELATION TO DISEASES IN OTHER PARTS OF THE BODY

A FULL and adequate discussion of the interrelations between the gastro-intestinal tract and other organs or systems, as to their functions and diseases, would fill a large volume alone. But they call for some consideration here, even though it must be less extended than the subject demands. We know that in many febrile affections, and as a rule in high fever from any cause, the digestion is disturbed, the appetite is impaired, and the tongue heavily coated; constipation or diarrhea develops in most cases, and nausea and vomiting may occur at times as complications. In the advanced stages of most organic diseases the digestive functions are likely to be markedly lowered, and in certain affections of the skin, including nearly all those not dependent upon local irritations or general exogenous infections, the intestinal digestion especially is usually impaired and the metabolism deranged. We know, too, that derangements of the functions of digestion and assimilation affect directly or indirectly all the other functions of the body. Thus much can be said with a good degree of certainty, but when we go further and seek for a definite relation between the diseases of other organs and the amount of secretion or degree of motor power in the stomach, as has been done, we meet with disappointment.

No such uniform relation has been demonstrated to exist between any of the gastro-intestinal functions and the different general or local diseases involving other parts, especially as regards the influence of these diseases upon such functions. The nearest approach to such uniformity is the tendency of

movable kidney to excite the gastric glands and chlorhydria. Again defecation is likely to be disturbed one way or the other in nearly every serious general disease as well as in a large proportion of the local ones, frequently by depressing it, producing constipation more common in typhoid fever and in some of the forms of septicæmia, and often results secondary irritation produced by hard fecal masses in chronic cases.

The foregoing general statement must suffice to show the relation of most other diseases to those of the intestines and to the functions of the digestive system.

However, the relation of the maladies of the principal organs and systems to the digestive function requires special mention.

DISEASES OF THE HEART

Cardiac affections, involving a lowered blood pressure, valvular defects not well compensated—and dilated heart, or decided weakness of the cardiac muscle—cause, generally lessen the secretion of HCl in the stomach and of the bile in consequence of the stasis, with resulting indigestion and constipation.

Riegel notes that in these cases the stomach secretes sufficiently for the small test breakfast, but not for a heartier test dinner, and I have observed that in such conditions, resulting from neurasthenia, there may be a good secretion in the morning, when the patient is fresh, but not enough in the latter part of the day, when he is fatigued. These facts should teach us something of the management of such patients. It is a manifest fact that numerous small feedings will best nourish patients with poor circulation, and that more rest—less exhausting force by the usual activities—will do most for them. Flatulence directly disturbs the heart, causing irregular pulse, etc.

Much more interesting and worthy of study than the effects of other diseases upon the digestive processes are the effects of impaired digestion and faulty assimilation upon the other functions, and even upon the tissues of the organism.

How Digestive Faults Injure the Heart.—Certain of the products of a faulty metabolism tend to increase the labor of the heart by contracting and possibly also roughening the inner coats of the smaller arteries and capillary vessels generally, as claimed by Haig. Croftan¹ has reported experiments proving that some of the xanthin bases can produce both hypertrophy of the heart, and chronic nephritis in animals. Haig has reported many clinical observations which tend to show increased arterial tension under dietetic methods which produce an excess of uric acid, and he has built upon these observations his well-known theory as to the toxic effects of uric acid upon the nervous system and various organs. His results are now explicable on the hypothesis that the alloxuric or xanthin bases, substances of the uratic group, and probably not uric acid itself, were responsible for the results observed by him.

To go a step further back, the digestive processes need to be perfectly performed in order that the metabolism may be complete, though when one overeats and underexercises, there may be, easily enough, a disturbed metabolism in spite of a naturally sound digestion. An excessive secretion of HCl (hyperchlorhydria) tends to exercise a very irritating effect upon the mucosa of the intestines, with the result in many cases of setting up catarrhal inflammation, with constipation, etc. Few things tend more surely to produce a deranged metabolism, with the production of excessive fermentation and putrefaction, than intestinal catarrh and a sluggish intestinal peristalsis. These conditions increase enormously the absorption of toxins from the intestinal tract.

You will readily understand that what is true of hyperchlorhydria is still more true of the same condition of HCl excess, plus an open sore in the stomach or duodenum, such as we have

¹ *Jour. Amer. Med. Assn.*, July 8, 1899.

in the round or peptic ulcer of these parts. Still greater and more profound is the disturbance of metabolism in such a serious disease as cancer of the stomach, pancreas, or any other of the digestive organs. The same is true in the case of a very markedly weakened motor power in either the stomach or intestines, or the downward displacement of any of the viscera. All these diseases and derangements seriously affect nutrition and impair the metabolism with a double resulting injury to the heart—an impairment of the nutrition of its muscular fibers and an increase of its work, in very many cases, through the contraction of the smaller vessels throughout the body by the toxic products of incomplete metabolism as above explained.

When there exists for long periods a marked deficiency of secretion on the part of any of the important digestive glands, whether this deficiency coincides with a catarrhal process in the mucous membrane or depends merely upon nervous or reflex influences, the metabolism may be affected almost as injuriously as in the cases of HCl excess. A deficiency of the gastric juice is very frequently found with an excess of indican in the urine, and though my own experience has been that hyperchlorhydria most frequently coincides with indicanuria, I can well believe that either departure from the normal, when pronounced, can so far derange intestinal digestion as to increase fermentation and putrefaction in that part of the alimentary canal. Increased fermentation, and especially putrefaction of the proteids, go with incomplete oxidation, and if the theories of various foreign investigators, which have been confirmed and extended by observers in this country, are accepted, we must believe that in such conditions the work of the heart is notably increased through a contraction of the peripheral blood-vessels.

Summary.—To sum up, then, disorders of the digestive organs, and especially the imperfect metabolism which results from them, are capable of injuring the heart in at least two ways: (1) By impairing the nutrition of the muscular tissues of the heart itself through imperfect digestion and assimila-

tion of the food; (2) by increasing the work of the heart through a narrowing of the peripheral blood-vessels—possibly also by a roughening of their lining membrane—as a result of the toxic action of certain products of incomplete oxidation of the proteids, and perhaps other faulty metabolic processes.

Therapeutics of Secondary Cardiac Affections.—Degenerative myocardial changes, with hypertrophy often at first, but later usually some degree of dilatation, are the forms of disease which are most likely to result from the digestive and nutritional disorders just described. Manifestly, when a contraction of the peripheral vessels has played a large part in causing the trouble, the curative measures which will be most promising are the mildest forms of exercise and the hydriatic procedures which tend to dilate the capillaries, rather than any medicinal remedies which exert a contrary effect, valuable as the latter are in more serious conditions of cardiac dilatation with an extremely low blood pressure. The Nauheim method of treatment usually suits well in such cases. It is equally obvious that the primary faults in the digestive apparatus need to be first of all removed, and such a regimen instituted as shall prevent their recurrence.

DISEASES OF THE KIDNEYS AND DIABETES

These have been much studied as to their influence on digestion, but with contradictory results. In early or mild cases, there may be a normal, increased, or diminished proportion of HCl, but in severe or advanced cases, naturally, there is a diminution. Riegel, however, reports having frequently found a normal amount of HCl in even old chronic cases of renal disease.

Influence of Bright's and Diabetes on Digestion.—My own experience has shown a like variability in results as to both Bright's disease and diabetes. There is no constant relation between the gastric secretion and the amount of albumin or sugar passed, but in the later stages, when the general health

has become seriously damaged, gastric secretion suffers, as does doubtless that of all the glands.

In all such cases it is important, therefore, to make tests occasionally of the gastric contents, since both medicines and the diet prove most effective when suited to the condition of the stomach. Persisting long with alkaline treatment when there is no free HCl cannot help but destroy what little digestion is left, and on the other hand, administering mineral acids with a diet rich in soups and meats, or meat extracts in any form, would soon play havoc with a case of diabetes complicated with hyperchlorhydria.

As in the case of the heart, disease of the kidneys may ultimately result from certain of the products of indigestion and the consequent deranged metabolism.

In a paper recently written by me¹ concerning autotoxic forms of nephritis, eighteen cases were reported showing albumin and casts which had developed apparently as a result of digestive disorders. All but one were cured, or markedly benefited, by a persistent employment of the static wave and static induced currents.

ANÆMIA AND CHLOROSIS

The results of experiments and observations are scarcely more uniform here.

Influence of Displacements of the Viscera upon the Blood.
—There is, however, a preponderance of evidence to the fact that chlorosis is unusually prevalent in girls who have displacements of the stomach or other viscera—gastroptosis, or splachnoptosis. In these cases there should certainly be a particularly careful examination of the abdomen to determine the position of the viscera, so that displacements may be remedied. But in chlorosis, too, the proportion of HCl may vary much and be normal, excessive, or deficient. Riegel considers that in simple

¹The Effects of the Secondary Static Currents in Removing Albumin and Casts from the Urine, with Reports of Cases, *Am. Med.*, vol. vi. No. 22.

chlorosis the secretion and motor power of the stomach are not as a rule decreased—more frequently, indeed, increased.

On the other hand, in the anæmias, although here also the findings have been various, and no uniform rule holds, there is a rather greater probability that the production of HCl will be diminished, especially when it is remembered that there is a peculiarly close relation between some of the more profound types of anæmia and the total absence of secretion in the stomach—achylia gastrica.

The motor function of the stomach is rarely under normal in either anæmia or chlorosis, except when, as occasionally happens, especially in the latter, there is a marked excess of HCl.

Influence of Constipation and other Gastro-intestinal Affections.—Judging from my own experience, constipation is almost constantly associated with chlorosis, and is very likely to complicate anæmia. You should always remember, however, that constipation may easily pass over into diarrhea by a process already explained.

Gastric and intestinal affections nearly all tend finally to impair the crasis of the blood. Dyspeptics rarely have a good healthy color.

THE RELATION OF THE GASTRO-INTESTINAL FUNCTIONS TO TUBERCULOSIS

Since tuberculosis is an infectious disease from which the healthy and robust are comparatively immune, and to which the debilitated are especially prone, you should readily understand how any seriously depressing affection in the gastro-intestinal tract can pave the way for it. HCl has been shown to exert a decided influence in inhibiting the development of the tubercular bacilli, and it is evident that persons whose gastric glands secrete abundantly are in less danger of becoming infected through their food or drink, but are not apparently in much less danger of infection through the respiratory tract.

A paper entitled Stomach Conditions in Early Tuberculosis, read by me before the American Climatological Association in

Washington in May, 1900, and subsequently published in the *Philadelphia Medical Journal*, considered fully the relations of this most important disease to the digestive functions, and I here append the larger part of it:

Impaired Digestion Conducive to Tuberculosis.—"In what has been incorrectly styled the pretuberculous, but should be called the incipient, stage of consumption, the most noticeable symptoms are often those of flatulent dyspepsia, with eructations and pyrosis or heartburn, with or without gastric pain, nausea, and even stubborn vomiting. These are sometimes symptoms merely of a lowered nerve-tone, and at other times evidences of actual gastric involvement.

"All the possible affections of the stomach may, of course, precede tuberculosis. Indeed, its development must be favored by gastric dilatation, the various forms of chronic gastritis, and a failure or persistently depressed activity of the peptic glands, from whatever cause, nutrition being lowered in this way to a degree which may render infection possible.

"Moreover, it is probable that, contrary to general belief, hypersthenic conditions in the stomach, such as hyperchlorhydria and acid gastric catarrh, are quite as compatible with tubercular infection through the lungs as are the asthenic types of gastric disease. For it is now known that a large proportion of the cases of early phthisis—a preponderance of them, according to some observers—has an excessive secretion of HCl.

Free HCl Often Present.—"Though not a very large number of reports of analyses of the stomach-contents in the early stages of tuberculosis are to be found in medical literature—and this question, therefore, cannot be said to have been positively decided—the evidence so far available points to the conclusion that, except in advanced cases with continuous fever, there is at least quite as likely to be an abundant secretion as a deficiency of HCl in the stomach.

"Van Valzah and Nisbet,¹ in 47 cases of incipient phthisis,

¹ "The Diseases of the Stomach," Philadelphia, W. B. Saunders & Co., 1898; page 646, *et seq.*

found in 10 no signs or symptoms of any gastric derangement. Three out of the same series had chronic gastritis, with an absence of free HCl, a diminished proportion of combined HCl, etc. In 18 of the cases there were traces only of free HCl and diminution of secretion otherwise. In 13 of this last number there was mild, and in 5 severe, stagnation, with fermentation.

"Among the 16 remaining of the 47 cases, 3 were found to have acid gastric catarrh—*i. e.*, the sthenic form of chronic gastritis, with an augmented secretion of HCl; 7 had the same acid in excess, with motor insufficiency, stagnation, and delayed evacuation; and in the other 6 there was also hyperchlorhydria, with fermentation in all; while in 2 of them the stomach was unable to empty itself even during the night.

"In 26 cases, first examined by the same authors during the stage of consolidation, 4 were normal as to gastric juice, 5 had chronic asthenic gastritis, one had a trace only of free HCl, and in 13 the secretion was variable, which means that sometimes it was in excess, and at other times normal or deficient.

"Thus in 47 incipient cases there were 26, or 55 per cent., with either a normal or overacid gastric juice; and of the 26 in the stage of consolidation, in 4, or 15 per cent., the secretion was normal constantly, and in 50 per cent. more it was variable, that is normal or above, a part of the time. In 65 per cent., therefore, of the 73 comparatively early cases studied by Van Valzah and Nisbet, the secretion of HCl was normal, or above, at least a part of the time.

The Motor Function Mostly Depressed.—"Riegel" quotes Klemperer as thus summing up the results of his observations in 14 cases, 10 of early and 4 of more advanced phthisis. In the beginning the secretory capacity of the stomach was mostly increased, often normal, seldom lowered; in the final stage markedly lessened. Klemperer found, however, that in all the forms of dyspepsia associated with tuberculosis the motor function of the stomach was depressed.

¹ "Erkrankungen des Magens," Wien, Alfred Hoelder, 1897, pp. 946-947.

"Brieger,¹ quoted by Riegel, studied 64 cases of tuberculosis, all except 6 of which were in a more or less advanced stage. In such a series there would naturally be a balance of depression in all the gastric functions. In 33 per cent. of even the more severe cases, Brieger found a normal condition of the gastric juice, while the same was found in 33 per cent. of the cases classed as moderately severe. In 4 incipient cases, he found 2 with normal secretions and 2 with disturbed chemism, the inference being that in tuberculosis was a variable condition.

"Riegel² states that the results of his own observations accord in the main with those of Klemperer and

"Croner³ in 36 cases of early phthisis found four cases of complete failure of HCl. The total acidity varied from 10 to 80, but it was in most cases normal.

"Unfortunately for the cause of medical science and the best interests of patients, physicians in general have not made, themselves, or have made, analyses of the gastric contents except when cancer is suspected, and even the specialists, I fear, have been in the past almost entirely different to the modern exact methods of studying gastric functions. During fifteen or more years of my own clinical practice, when I saw many tuberculous cases, I never made a chemical analysis of the gastric contents, nor did I employ the simpler methods of determining the motor function of the stomach.

Frequent Intolerance of the Usual Remedies.

The reports of cases reported by Van Valzah and Nisbet, by Klemperer, show that in early tuberculosis there is a very frequent—and probably in a majority of cases a condition of the peptic glands which contra-indicates the administration of any considerable doses, by the stomach, of highly stimulating remedies, such as carbolic acid and its derivatives, the mineral acids, and most of

¹ *Loc. cit.*

² *Deutsche Med. Woch.*, 1898, No. 48.

stomachics. That is, in these cases when the gastric function is not entirely normal, there is usually either an excess of HCl, or a very impressionable and variable condition of the secretion—a condition in which the exhibition of stimulating drugs produces harmful irritation, resulting often in hyperchlorhydria, or acid gastric catarrh, which complicates the treatment of the tuberculosis and lessens the prospects of cure. Riegel's experience agrees with that of the authors cited, and my own case well illustrates the point just made, besides showing how tuberculosis for a long time may masquerade in the guise of a stomach trouble.

"In the light of these facts, it is easy to understand why such directly opposite views are held by clinicians of equal ability as to the value of large doses of creosote and of other irritant drugs in tuberculosis. Whether the remedy does good or harm depends mainly upon the condition of the stomach, and, it not having become yet the settled practice, as it ought to be, always to ascertain the state of the gastric functions before instituting active drug treatment in any chronic disease, a confusing contrariety of results follows such modes of treatment.

"For exactly the same reason the profession is divided as to the value of cod-liver oil in pulmonary phthisis. Recent experiments prove that the oils markedly lessen the secretion of HCl in the stomach.¹ In the cases, therefore, in which the gastric functions are almost always depressed, as in the later stages of phthisis, cod-liver oil, or much fat of any kind, impairs digestion and injures the patient; whereas, in the cases of hyperchlorhydria, which are so often found in the earlier stages, the same remedy exerts a double influence for good, since here it tends to correct the injurious hypersecretion at the same time that it helps to fatten and strengthen the patient. In the cases between these extremes—cases in which there is a nearly normal gastric secretion—a moderate amount of oil may

¹ Bachman, "Experimentelle Studien über die diätetische Behandlung bei Superacidität," *Archiv f. Verdauungskrankheiten*, B. v., Hft. 3.

prove helpful for a time, and by means of an occasional analysis of the stomach-contents to see when it has begun to secrete unduly, advantage may safely be taken of its medicinal and nutrient qualities.

“Let me turn aside right here to advise that in cases, in which an analysis of the stomach-contents is not practicable, as well as in cases in which the gastric secretion is found to be about normal, it would be well to administer a small dose or one of its congeners with cod-liver oil, so as to utilize the stimulating properties of the former to neutralize the influence of the latter upon the gastric glands.

Need of Strengthening the Motor Function. It is generally conceded that the motor function of the stomach is always seriously lowered in advanced phthisis. It is to be depressed somewhat in even the earlier stages, when the muscular walls of the organ lose their tone, which results in a tardy evacuation of the contents, with consequent stagnation and fermentation. This weakened motor function must be overcome before tuberculous patients can get well.

“Drugs are of little avail for this condition, but exercises, especially in the open air, as from hill walking, bicycling and rowing, are highly curative in connection with a diet which is at once digestible, nourishing, and bulky. We should avoid in such cases overloading the stomach, and much liquids should not be taken with the food. Pulley exercises and gymnastics for the trunk and arms are very useful. Massage of the abdomen can be of good use, except when the gastric glands are irritable; then it can overstimulate and do harm, as has been pointed out by me in a previous paper. Faradism is also most helpful, but must be used with discretion.

“The points emphasized in this paper may be summarized:

¹ *Massage of the Abdomen*, by Boardman Reed, M. D. *Mag.*, January, 1898.

Conclusions.—1. "In early tuberculosis, the secretion of HCl in the stomach is very frequently excessive, the peptic glands being in a condition of irritability, which causes stimulant remedies of the creosote class to disagree and act injuriously.

2. "Oils tend to depress the secretory function of the stomach, and in consequence, cod-liver oil is likely to help the cases which the creosote class of drugs hurt; but, on the other hand, hurts the cases in which the gastric secretion is inactive, the very one in which creosote and the like often do good.

3. "Therefore it ought to be the rule to ascertain the condition of the secretory function of the stomach before pushing either class of remedies.

4. "When analysis of the gastric contents cannot be made, it is safer to combine creosote with cod-liver oil, so as to let one neutralize the other in its influence upon the stomach.

5. "The motor function is very generally depressed in tuberculosis, and must be restored before a cure can be brought about. Drugs avail little in this direction, but diet, exercise, especially in the open air, faradism, and abdominal massage—except when hyperchlorhydria complicates—are all valuable means of effecting the result."

CATARRHAL AFFECTIONS OF THE RESPIRATORY TRACT

Specialists in diseases of the nose, throat, etc., are coming more and more to the conviction that the catarrhal affections of this region, as well as of the bronchial tubes, are determined largely by a faulty metabolism. The chief predisposing condition is what was formerly known as the uric acid diathesis, an obscure vice of nutrition due in part to inheritance, and in part to eating excessively, especially of meats and sweets, by persons who lead a sedentary life and exercise little—*i. e.*, a condition of suboxidation. My own observations have convinced me that this explanation of the ætiology of such catarrhs has much in its favor and have led to the suspicion that the mucous

membranes may have for one of their functions of certain of the products of a faulty metabolism.

I have seen numerous cases of chronic catarrh, as well as of chronic bronchitis, which associated with indigestion and lithæmia, but relieved or improved by remedies which favor elimination of the uratic products, xanthin bases, etc., times the combination of such remedies—chiefly with antiseptics like the benzoates, salicylates, etc.—more effective.

NERVOUS DERANGEMENTS, NEURASTHENIA, INSOMNIA, ETC.

The sympathy between the digestive and nervous system is particularly marked.

Neurasthenia.—It is certain that all the forms of nerve weakness or depression—neurasthenia—tend to derange the digestive functions and metabolism. It is less a fact that diseases of the stomach and intestine, as most of the more serious disturbances of the digestive assimilation, influence adversely the nervous function. A vicious circle is formed. They impair sleep, produce insomnia, lower the capacity for sustained physical effort, and develop an irritability of temper. This is in some instances due to a reflex irritation of the nervous centers, and in others, to an autotoxic influence on those centers and the nerve structures generally, due to impoverishment or depravation of the blood.

Insomnia is particularly often dependent upon indigestion. Any of the painful gastro-intestinal diseases, such as cancer, ulcer, colic, or even marked flatulency, may disturb or wholly prevent the sleep by the actual discomfort produced by them. But you should note a curious and interesting fact that an excess of Hydrochloric juice—hyperchlorhydria—will often greatly improve sleep, even when it gives rise to no pain or conscious

in the stomach. So common is this that in any case of stubborn insomnia, not due to pain or other manifest cause, you should test the stomach contents to see if there is not an excess of HCl, or if this cannot be done, try the effect of one or two teaspoonfuls of sodium bicarbonate, administered, well diluted, at bedtime. It will sometimes, in such cases, accomplish much more than the usual hypnotics.

Auto-intoxication, resulting indirectly from the more serious and persistent derangements of digestion, besides being able to disturb the nervous functions in the ways mentioned, is capable, doubtless, also of injuring ultimately the nerve structures themselves, and setting up organic lesions in the nervous system, just as it can in the circulatory system and the kidneys.

DISEASES OF THE LIVER AND GENITAL ORGANS

The liver is another organ which can be damaged seriously by prolonged gastro-intestinal disease. There is no longer room for doubt that various hepatic lesions, including a form of cirrhosis, can have such an origin. Boix has written a book entitled "The Liver of Dyspeptics," in which this subject is discussed at much length.¹

Conversely, too, hepatic affections can greatly derange the functions of both the stomach and intestines. But space is lacking for as full a consideration of these interesting relations of the stomach and liver as their importance deserves.

The interrelations between the stomach and intestines on the one hand, and the genital organs on the other, are very intimate. The functions of the one are rarely much deranged without some sympathetic disturbance in those of the other. This is as might be expected, considering the fact that the nerve supply of the two systems is in large part from closely associated centers—particularly the vaso-motor nerves, which control the caliber of the arterioles in each set of organs, and thus regulate the blood supply to them.

I have already referred (Lecture XLIX.) to the marked ef-

¹ G. P. Putnam's Sons, New York, 1897.

fect of movable kidney in setting up hyperchlorhydria by reflexly exciting gastric secretion, and have dwelt at some length, in Lecture XLIII., upon the frequent dependence of pelvic troubles, such as displacements of the uterus and ovaries, upon gastropptosis or enteroptosis. Then, hyperchlorhydria by the irritating effect of the excessive acid upon the intestinal mucosa is a prolific cause of flatulence, and I have seen many cases in both sexes in which flatulence has reflexly irritated the sexual organs, producing at night painful erections in men, with unrefreshing sleep, and analogous disturbances in women. Most gastrologists have observed that women having stomach trouble will often secrete during their menstrual periods more or less HCl than usual; there is no uniformity as to the kind or amount of the aberration from the normal, but it may be in either direction, and either slight or very marked. The fact is well known that various forms of gastric derangement may result from disease or displacement of the uterus or ovaries; but it is not so well known that disease of the prostate gland in men may disturb the digestion.

LECTURE LXXXII

THE SURGERY OF THE STOMACH AND INTESTINES

It is not intended in this lecture to describe in detail the technique of the various surgical operations which have been useful for certain diseases and disorders of the gastro-intestinal tract, but to give you a general idea of them, and the leading indications for them. The general practitioner often has not the time to keep fully informed upon all the modern advances in surgery, and a concise synopsis of such of these as pertain especially to our subject should, therefore, prove of value.

SURGERY OF THE STOMACH

Gastric Ulcer.—Ulcer of the stomach should be subjected to a surgical operation in the presence of any of the following complications:

(1) When the patient has persistent or repeated vomiting of either blood or ingesta, or becomes worse in any way in spite of dietetic and medicinal treatment. (2) Perforation. (3) Perigastric adhesions.

Keen and White have tersely summed up the objects of surgical intervention in gastric ulcer as arrest of hemorrhage, excision of the ulcer, and suturing of a perforation. To these should be added, to get food into the stomach when the cardiac orifice is closed and to empty it when the pylorus is occluded.

The chief operations done in accomplishing these objects are gastrotomy, gastrostomy, gastro-enterostomy, gastro-gastrotomy, and pyloroplasty, which will be briefly described below.

Other surgical operations and procedures often required are the dilatation by bougies, or otherwise, of a stricture at the cardiac orifice, either from above, through the esophagus, or

from below, through the opening made by a gastrotomy; and the division of perigastric adhesions.

To excise an ulcer and incidentally control any existing hemorrhage, an abdominal incision is made in the median line. The opening made in the stomach should be about 5 cm. long. If the ulcer is on the posterior wall, it must be reached by the opening in the anterior wall. If the ulcer is on the anterior wall, it is easily excised and the wound closed, as in the other operations upon the stomach. The ulceration may merely involve the mucous coat of the stomach, in which case only the diseased part of the mucous membrane is removed and the cut edges sutured with fine silk. When the ulcer is deep and involves all the layers, a part of the stomach wall must be excised. If the bleeding is from a single ulcerated area, it is easily controlled by excision of the ulcer, but if the blood comes from a large number of minute areas, the only useful procedure possible is performing gastro-enterostomy, which, however, is believed to be of doubtful value in this condition. Gastro-enterostomy is also indicated when the ulcer is large in extent. This prevents stagnation of food in the stomach, and as a result, the unhealthy tissue may regain its normal tone in a few months. The mortality rate of this operation varies from 12 to 25.5 per cent. Perforation of an ulcer always demands an immediate laparotomy. The ulcer should then be excised, and the opening closed as if it were a gastrotomy wound. Da Costa does not consider excision of the ulcer necessary, but prefers to bury or cover the ulcer with stomach wall. Sometimes the area of the stomach wall immediately around the ulcer is so thickened from inflammation that it is impossible to close a perforation by suturing, in which case it is necessary to perform a gastrostomy, that is, unite the edges of the perforation to the edges of the abdominal wound. The success of operation in perforation varies with the different operators, but the mortality is high—45 to 60 per cent.

Cicatricial Stenosis of the Cardiac and Pyloric Openings of the Stomach.—Cicatricial obstruction of the cardiac orifice of

the stomach should always be first treated, when practicable, by means of gradual and persistent dilatation. This is done by the passage of bougies, if possible, from above through the esophagus, until the lumen has been restored to the normal, after which the largest bougie passed should be used once or twice a week for some months in order to prevent the return of the stricture. If the stricture is impermeable to the passage of a bougie from above, a simple incision is made in the wall of the stomach (the operation of gastrotomy), and the attempt made to dilate the stricture from below. Sometimes a fine bougie, with a string fastened to one end, is passed down through the stricture, and one end of the string then brought out through the external incision. This string is pulled to and fro to dilate the stricture. The gastrotomy wound is then closed and the re-formation of the stricture prevented by the frequent passage of bougies. If the stricture does not allow the passage of the sound from either side, a gastrostomy must be performed. This operation consists in forming a gastric fistula through which the patient may be fed. Gastrostomy was originally performed by suturing the stomach to the abdominal wall and then making an opening that led directly into the cavity of that organ. This was found to be unsatisfactory, inasmuch as the leakage of the gastric contents could not be prevented. During the last few years a large number of modifications of this operation have been devised, the success of which depends upon the formation of a valve or sphincter in the gastric opening, which prevents the escape of food from the stomach. The form of this operation, now generally employed, is the one recommended by Witzel. The abdomen is opened by an incision below and parallel to the left ribs. The left rectus is cut in a vertical and the transversalis in a lateral direction. The stomach is partly drawn through a vertical incision in the peritoneum. Its anterior wall is incised to permit the passage of a rubber tube five inches long and about the diameter of a No. 25 French catheter. The tube is held in place by means of two vertical folds of the stomach wall, which are

brought together over the tube and fastened by a number of muscular sutures. The external end of the tube is brought out of the upper end of the abdominal incision. The stomach is sutured to the parietal peritoneum, and the abdominal wound closed, except where the tube makes its exit. A permanent canal may form, after which the tube is removed, to be replaced when it is desired to feed the patient. All solid food is first masticated by the patient and then introduced into his stomach through the rubber tube. The mortality rate of this operation in benign disease is about 6 per cent. ; in malignancy, it is about 25 per cent.

If the stenosis of the cardia is due to malignant disease, gastrotomy should not be delayed too long, as is usually done. The diseased area is much more likely to improve if the dilated pouch in the esophagus above the cancer be kept clear and food not allowed to stagnate there.

Cicatricial stenosis of the pylorus may sometimes be overcome by doing a gastrotomy and then dilating the stricture, but is usually best treated by means of a pyloroplasty. This consists in making a longitudinal incision in the pylorus about 6 cm. long. The edges of the incision are retracted and then sutured in a direction transversely to the long axis of the stomach. A new pylorus is thus formed, the posterior wall of which consists of the old pylorus and the anterior wall of new tissue obtained from the duodenum and stomach. The mortality rate is about 10 per cent. Sometimes this operation fails to give relief, because the outlet is too high up for the stomach to empty itself. A gastro-enterostomy is then indicated. By this operation an anastomosis is formed between the upper part of the small intestine and the stomach. The jejunum is usually considered the most suitable portion of the intestines to be united to the stomach. The intestine is so arranged that, when joined to the stomach, its peristaltic waves travel in the same direction as do those of that organ. It makes but little difference whether the jejunum is fastened to the anterior or posterior wall of the stomach, so long as it is to the

most dependent portion of that organ. Joining the intestine to the anterior wall is the easiest method, but the tendency of bile to regurgitate into the stomach is then greater, and hence the posterior anastomosis is preferred by many surgeons. In performing this operation the posterior wall of the stomach is drawn through an opening made in the transverse mesocolon. The anastomosis is done outside of the abdomen, thus avoiding any risk of peritoneal infection. If time is an important factor, the union should be made by means of a Murphy's button. If time permits, the intestine should be joined to the stomach by sutures, as their employment makes a larger anastomotic opening possible.

A number of complications tend to follow this operation. The most frequent one is persistent vomiting, which is usually indicative of the formation of the so-called vicious circle. This means the passage of food from the stomach through the anastomotic opening into the duodenum, and back into the stomach by way of the pylorus.

Pulmonary disturbances have often been noted after this operation. Many theories have been offered to explain their occurrence. The explanation by Wm. J. Mayo is accepted by most physicians. He believes that some of the venous blood does not pass through the liver, but carries septic emboli directly to the lungs. Other complications are leakage through the anastomotic wound, which is a very frequent cause of death; the anastomotic wound may contract if the pyloric passage is still pervious; the duodenum and jejunum on rare occasions become ulcerated. The mortality rate of gastro-enterostomy for malignant disease is 20 per cent.; for benign cases, 6 per cent. This operation is contra-indicated if the cancer is diffuse, and if the patient's general health is so much reduced that recovery from the immediate effects of the operation is very unlikely.

If the cancer is confined to the pylorus, and there are no extensive adhesions or glandular involvement, pylorectomy,—resection of the pylorus,—is indicated. For this purpose the

abdominal incision is made transversely over the middle of the tumor. The growth and the tissue on both sides for about 3 cm. are then excised. The duodenum is joined to the greater curvature of the stomach; a pyloric opening in this region is best, as it favors the free exit of the food from the stomach. There is a great diversity of opinion as regards the mortality rate of pylorotomy. Some authorities report a rate as high as 72 per cent. Such a death rate is chiefly due to the fact that patients delay operation until their vitality has been exhausted so that they are unable to resist the shock of a surgical operation.

Hourglass Stomach.—This is a condition usually brought about by adhesions following the healing of an ulcer; occasionally it may be congenital in origin. The stomach is divided into two sacs by a dividing stricture. The sac nearer the cardia is usually the larger. The surgical relief of this condition consists in joining the two sacs by means of an anastomotic opening (gastro-gastrostomy). A small pyloric sac contra-indicates this operation, and in its place a gastro-enterostomy should be performed. Other operations are occasionally employed. Some surgeons recommend resection of the stricture and suturing the pouches together. If the stricture is small, an operation is done similar to pyloroplasty in cases of stenosis of the pylorus.

Cancer and Sarcoma of the Stomach.—The surgical treatment of malignant disease causing stenosis of the cardia and pylorus has been referred to above. Here we will discuss the management of malignancy in the body of the stomach. If the growth involves the whole organ, but is not adherent to the surrounding structures, and there is little or no glandular involvement, the entire stomach should be removed. Such an operation is called a complete gastrectomy, and is done as follows: The duodenum is divided well below the growth. The gastrophrenic and gastrosplenic ligaments and the greater and lesser omenta are ligated and severed from the stomach. The latter is then removed by an incision at the esophagus. The end of

the duodenum or a loop of the jejunum is then joined to the esophagus, either by means of sutures or a Murphy's button. It has been demonstrated that removal of the stomach is quite compatible with a fairly good nutrition, provided the intestinal digestion has not been also impaired. If the tumor involves but a small part of the gastric wall, this should be excised. It is important that as small a wound as possible be made in the stomach, and that the incision be sutured in such a manner as to cause little or no tension.

Dilated Stomach.—An operation recently introduced for the relief of gastric dilatation is called gastroplication. This consists in folding the anterior wall on itself and suturing this fold in place by means of three or four rows of interrupted silk sutures. The greater curvature is thus raised toward the lesser, and the size of the stomach diminished. Gastroplication is contra-indicated in stenosis of the pylorus. This form of treatment has been successful in a number of cases, but nevertheless its value is questionable, and most surgeons prefer to perform a gastro-enterostomy.

Perigastritis.—Frequently a perigastritis causes sufficient disturbance to warrant surgical intervention. The operation called gastrolisis consists in freeing the adhesions which have joined the stomach to some other organ, and have developed from a localized peritonitis, due to a slowly perforated ulcer, or from the extension of inflammation from some other organ. The adherent bands are simply ligated and cut. Sometimes so large an area of the stomach wall is adherent that a resection of that portion of the stomach is necessary.

SURGERY OF THE INTESTINES

Duodenal Ulcer.—The surgical treatment of duodenal ulcer is similar to that of gastric ulcer. When the existence of such a lesion is highly probable, and repeated hemorrhages have occurred without any improvement having followed a strict diet and appropriate medication, or exclusive rectal alimentation for

a week or more, a gastro-enterostomy should be performed. This operation permits the food to pass directly into the jejunum; it thus prevents irritation of the ulcer by the chyme and gives it a chance to heal. When the cicatrix of an ulcer has caused a stricture of the duodenum, relief is only obtainable by means of either enteroplasty or gastro-enterostomy. Enteroplasty is performed in the same manner as pyloroplasty, and is the operation of choice in narrow circular strictures. If the constricted area is wide, an intestinal anastomosis should be done.

The most serious complication of duodenal ulcer is perforation, which requires an immediate laparotomy, suturing of the perforation, and cleansing of the peritoneal cavity. Authorities differ as to the time of operation in case of perforation; the majority of surgeons do not operate during the primary shock, unless hemorrhage exists, but wait until the patient rallies from the depression. However, the collapse following perforation is often so great that recovery does not occur, and hence it is urged that the operation be performed as soon as possible after the diagnosis has been made. After twenty-four hours the case is usually hopeless in spite of operation, though exceptionally the latter may succeed at a still later period.

Tuberculosis of the Intestines.—In primary tuberculosis of the bowel when multiple ulcers have appeared, the proper procedure is excision of the ulcerated areas. These ulcers usually appear in the cecum, and a number of successful excisions of this part of the gut have been reported. If an ulcer perforates, a laparotomy should be done immediately, and the opening closed. In hyperplastic tuberculosis, a tumor sometimes occurs, which often constricts the intestinal lumen. This is treated by removing the diseased section of the intestines and making an end-to-end anastomosis (entero-anastomosis). The tubercular ulcer may cause a stricture which, if tight enough to cause symptoms of obstruction, must receive surgical attention. If the constriction is small in area, it can be relieved by performing an enteroplasty; if this method fails, the

constricted portion of the bowel must be resected, and an entero-anastomosis done.

The Surgery of Intestinal Tumors.—The treatment of intestinal growths, whether they be benign or malignant, is complete excision of the diseased part. Even if a positive diagnosis is impossible, an exploratory laparotomy is usually justifiable in suspected tumors. The removal or excision of a neoplasm of the intestines is called enterectomy. The abdomen is opened in the median line, the diseased loop of the intestines is drawn out of the wound and incised at a point two inches beyond the tumor on either side. If the tumor is malignant, a wedge-shaped piece of the mesentery with its infected glands should also be removed. If the lesion is benign, the mesentery must be left intact, as its removal may interfere with the blood supply of the portions of the intestines to be united. The growth having been excised, the ends of the intestines are united either by an end-to-end anastomosis, lateral anastomosis, or lateral implantation. If the laparotomy is performed for cancer of the cecum, that structure should be excised, and the end of the ileum implanted into a slit in the ascending colon, a few inches above its closed end. If the growth is too far advanced to permit of its removal, the diseased part of the bowel is side-tracked and a lateral anastomosis done. If this plan is impracticable, an artificial anus must be formed in one of the inguinal regions, depending upon the position of the obstruction (colostomy).

The incision for colostomy is made over the portion of the colon to be incised, whether in the right or left inguinal region. The colon is drawn out of the wound; a small incision is made in the mesocolon, through which a glass rod is pushed. The ends of this rod rest on the abdomen on either side of the incision. The colon is sutured to the edges of the peritoneum. The opening in the gut is made at a second operation on the following day. If the obstruction is absolute, and immediate relief required, the bowel should be opened immediately. By drawing the colon forward, a pouch is formed proximal to the

artificial opening in which the feces may collect. Such an arrangement prevents the annoyance of frequent stools.

Intestinal Obstruction from Calculi, Worms, Volvulus, etc.

—The surgical treatment of obstruction caused by tumors, and by cicatrices following ulcers, has been discussed above. Other causes of obstruction which will be considered here are biliary calculus, intestinal concretions, ascarides, accumulation of feces, intussusception, volvulus, flexures and adhesions, and strangulation by ligamentous bands.

Biliary calculi often damage the intestinal wall considerably, and hence operative intervention should not be postponed too long. The abdomen should be opened and the position of the stone determined. If possible, crush the calculus with the fingers; if this fails, incise the gut and remove it. A method recommended by Tait consists in piercing the stone with a strong needle passed obliquely through the intestinal wall. To prevent leakage after the stone has been crushed, the aperture made by the puncture should be covered with peritoneum which is held in place by a few sutures. If the intestinal wall has undergone degeneration at the site of the stone, it must be resected and an anastomosis performed.

Obstruction due to *intestinal concretions*, masses of *ascarides* or other worms, or an *accumulation of feces*, if it resists all ordinary methods, must be subjected to operation in a manner similar to that advised for obstruction caused by gall stones.

Intussusception calls for surgical intervention, if the bowel remains irreducible by inflation or injections. If an operation is indicated, incise the abdomen in the median line and reduce the intussusception by gentle traction on the gut. If adhesions exist, they must be separated by means of a probe. After the bowel has been reduced, the mesentery at the site of the intussusception should be shortened by folding it upon itself and suturing it in place. If this measure fails to reduce the invagination, the following operation is available:

The bowel above the obstruction is joined to the lower part by anastomosis, a procedure especially indicated in chronic ir-

reducible intussusception in the adult, or when this accident is complicated by a polyp or cancer. If the above methods fail to reduce this condition, or if the walls are gangrenous, the intussusception must be excised.

Volvulus is one of the most fatal of all forms of intestinal obstruction, and on the other hand gives the most favorable prognosis, if an early laparotomy be done. The incision is made in the median line and the twisted portion of the intestine looked for. If the lesion is of recent occurrence, the loop can easily be untwisted; if adhesions exist, this may be impossible. In the latter case, puncture and empty the distended loop, close the opening thus made, and form an anastomosis between the intestine above and below the volvulus. If the loop can be untwisted, prevent recurrence by shortening the mesentery. If gangrene exists, the diseased area must be resected.

In intestinal flexure straighten the bowel and remove the flexure by excising a triangular V-shaped piece of the wall of the intestine and close the wound by sutures.

In obstruction due to hernia, taxis should first be tried, but if not successful within ten to fifteen minutes, operative intervention should not be delayed. (See Lecture LXIV.)

If *adhesions* or *ligamentous* bands are the cause of the obstruction, they should be cut between two ligatures, and the raw ends covered by stitching over them the healthy peritoneum.

Meckel's diverticulum is not infrequently the cause of intestinal strangulation; it may act as a band with the bowel caught underneath it. The treatment consists in severing the constricting band between two ligatures, and then removing the diverticulum in the same manner that an appendectomy is done. The tip of a long vermiform appendix may become adherent and thus form a band, underneath which a loop of intestine may become engaged. The treatment of this condition is the same as that of strangulation caused by Meckel's diverticulum.

Surgery of the Appendix.—The indications for performing an appendectomy will be found in Lecture LXVIII., on The Treatment of Appendicitis. The operation of appendectomy is done variously by different surgeons, and that for opening and draining an appendiceal abscess is also performed in different ways, but the following are brief descriptions of satisfactory methods:

In removing an appendix for chronic appendicitis, or during the interval between acute attacks, the incision may be made two inches internal to the anterior superior iliac spine, at right angles to a line drawn between the anterior superior spine and the umbilicus. The opening should be about two inches long. The muscular fibers are separated by a blunt dissection, which prevents degeneration of them and the tendency to the formation of hernia. The appendix is found by locating the colon, which is detected by its longitudinal bands. The anterior longitudinal band leads to the appendix. Adhesions must be destroyed. The mesoappendix and the neck of the appendix are tied with two strong silk ligatures, between which they are cut. Cauterize the stump of the appendix with pure carbolic acid. Invert the stump into the coats of the colon by means of Lembert sutures.

If the presence of an abscess is suspected, the incision is made parallel to Poupart's ligament and over the tumor mass, if such exists. The abscess is surrounded with gauze before opening it. If the appendix has sloughed off, remove it, but if it forms a part of the abscess wall, do not disturb it. The abscess is then evacuated, drained, and its cavity packed with iodoform gauze. In forty-eight hours replace the gauze with fresh pieces; after the second day, change the drainage material daily. When the appendix sloughs away, a fecal fistula occasionally develops; this would require a second operation.

A patient with appendicitis, operated during the interval, should be able to leave his bed in ten to fourteen days; when operated for a circumscribed appendiceal abscess, the con-

valescence is considerably prolonged, and when the operation is done after the development of general peritonitis the confinement to bed must be for a still longer period, provided recovery follows. The operation performed during the first thirty-six hours of a simple acute appendicitis approximates more nearly that done for chronic cases or in an interval.

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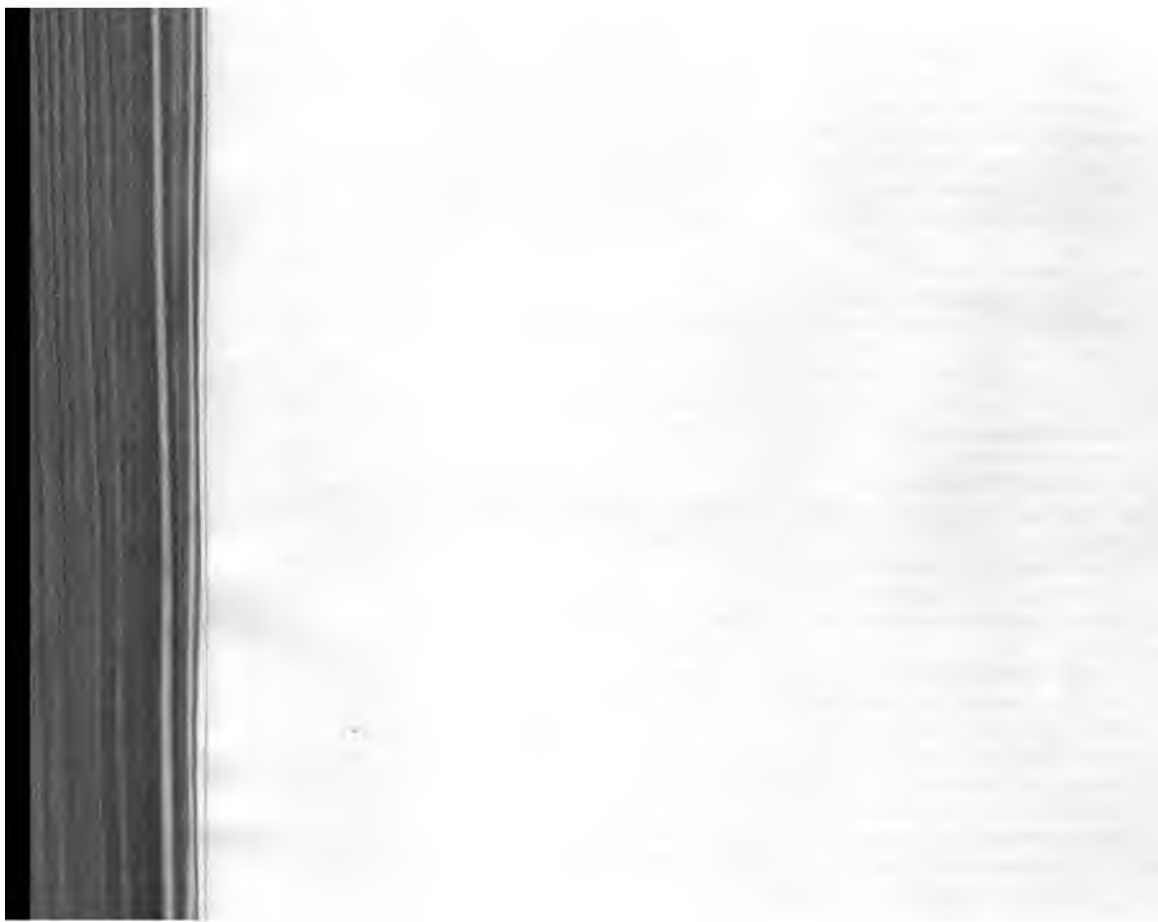
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